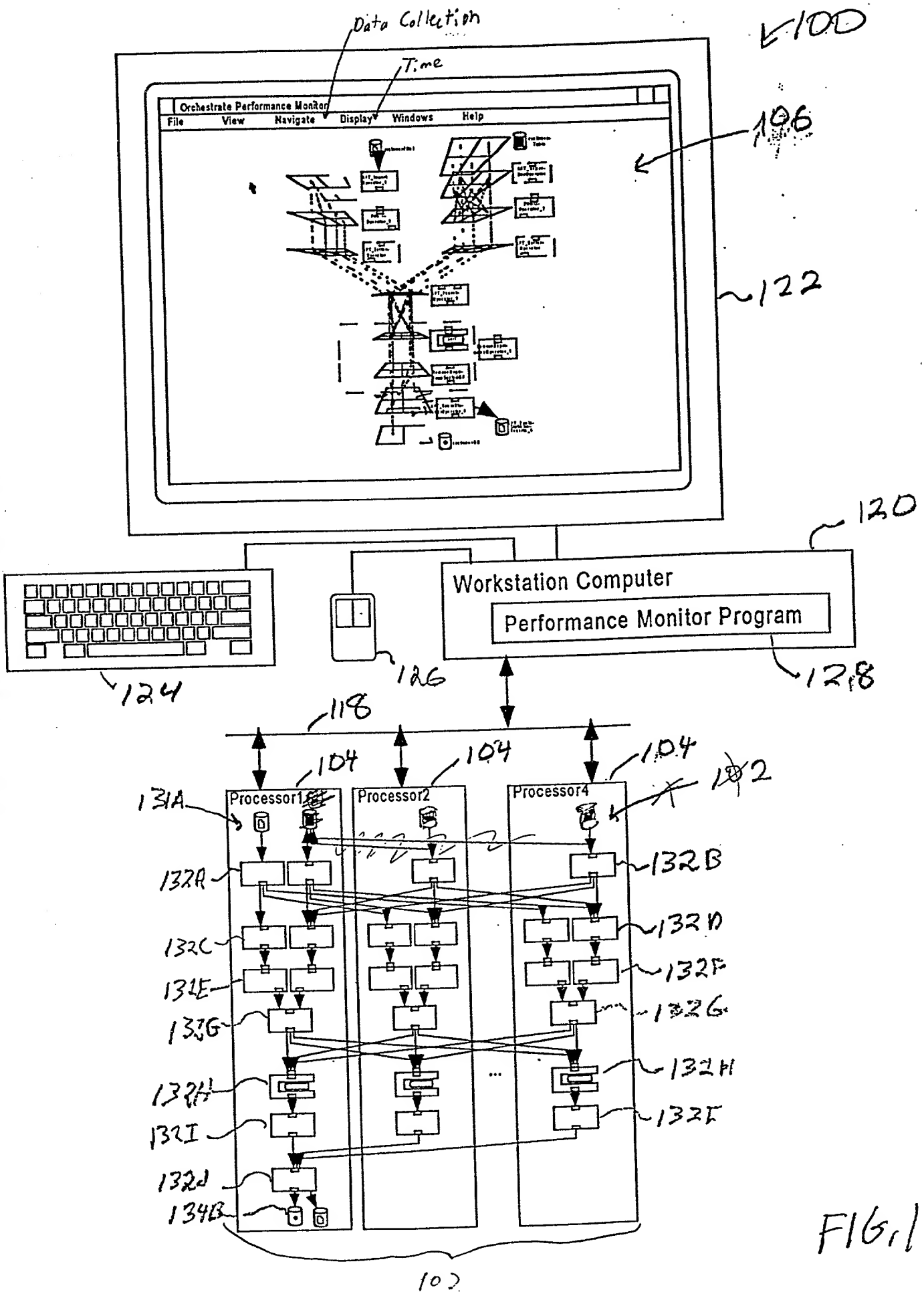

100
Data Collection
Time
Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
106
122
120
Workstation Computer
Performance Monitor Program
128
126
124
118
104
104
104
102
Processor1
Processor2
Processor4
131A
132A
132B
132C
132D
131E
132F
131G
132G
132H
132H
132I
132I
132J
134B
...
102

FIG. 1

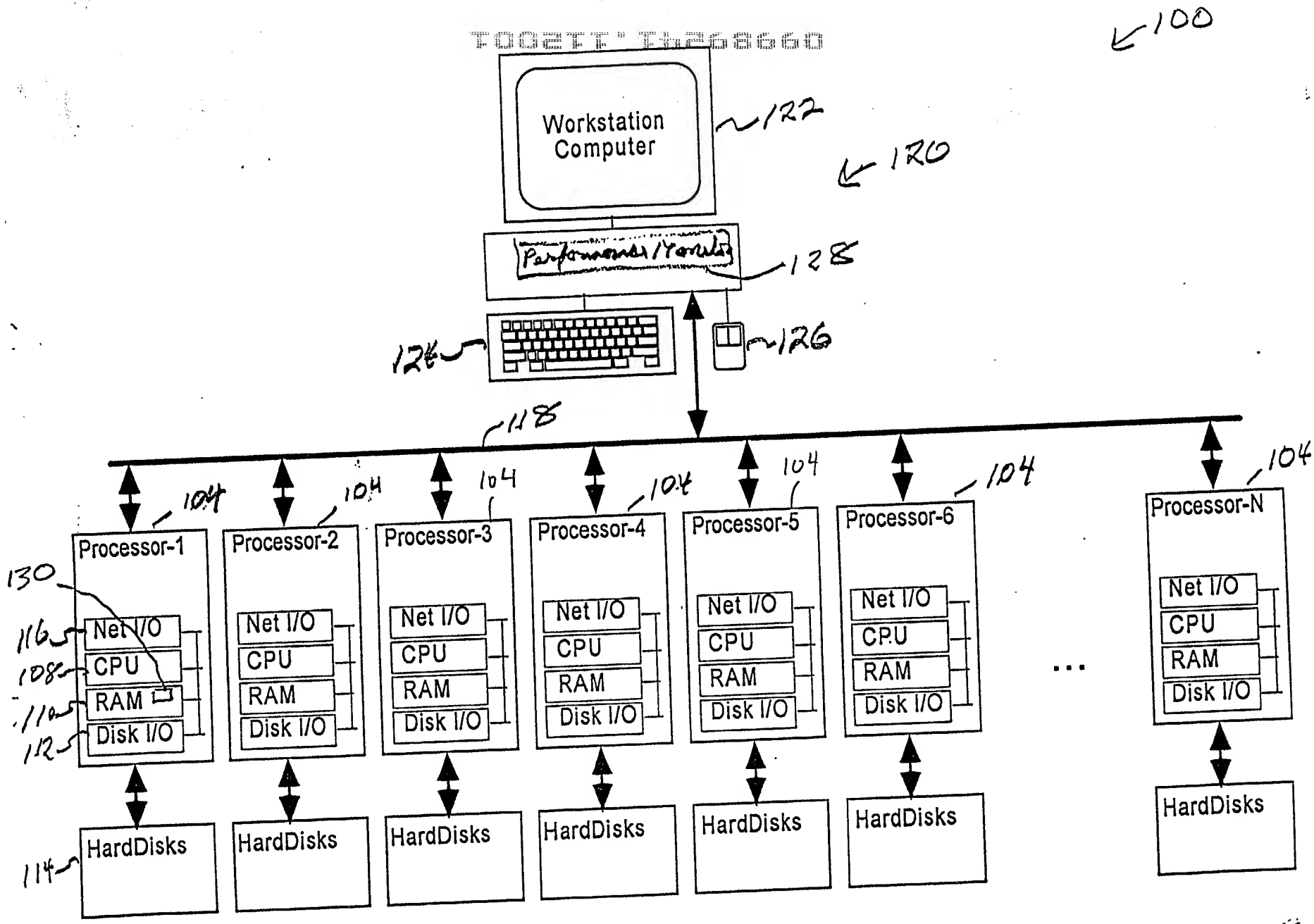

100
Workstation Computer
122
120
128
126
126
118
104
Processor-1
Processor-2
Processor-3
Processor-4
Processor-5
Processor-6
Processor-N
130
116
108
110
112
Net I/O
CPU
RAM
Disk I/O
HardDisks
114

FIG. 2

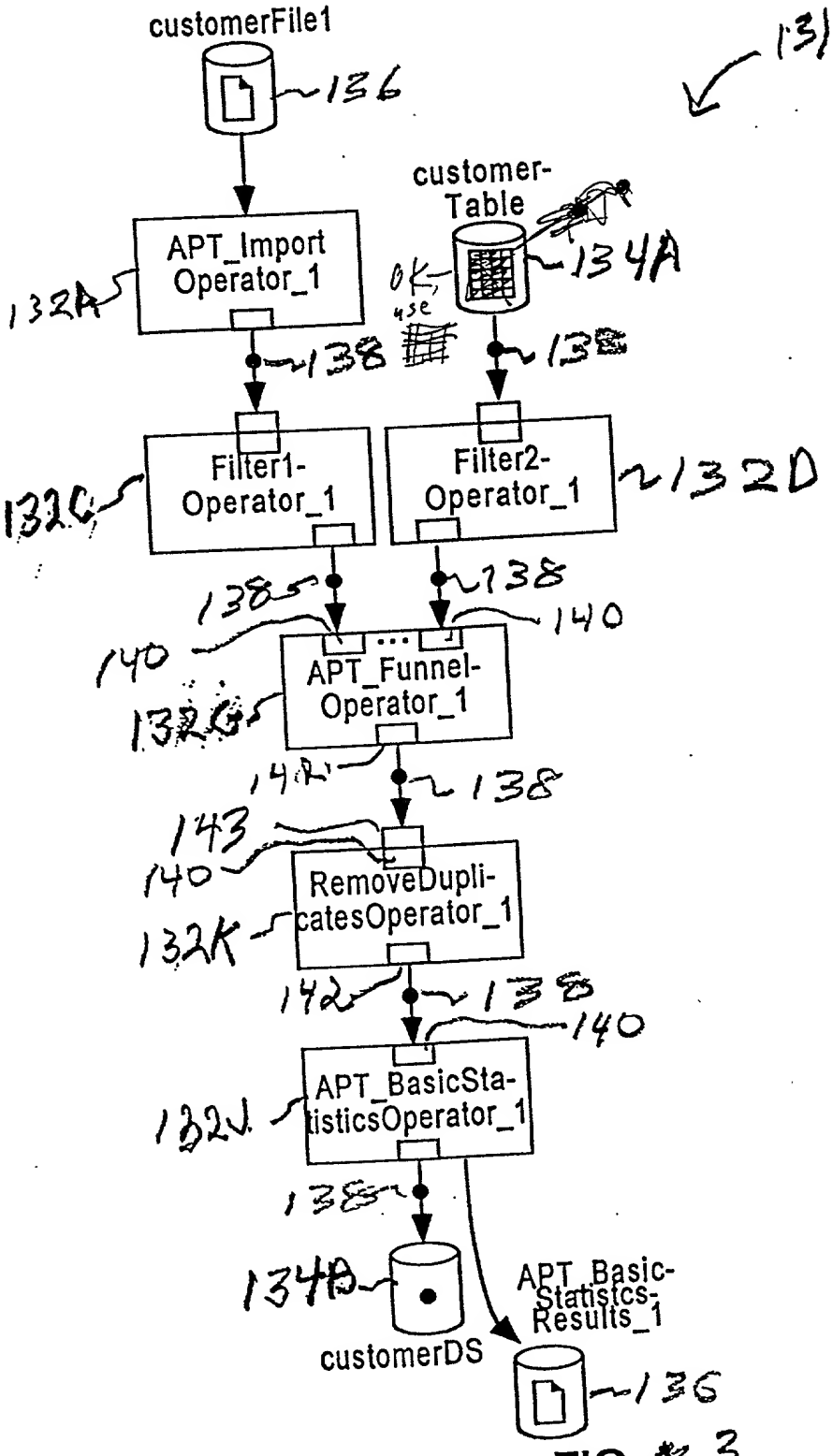

customerFile1
136
131
customer-
Table
APT_Import
Operator_1
132A
134A
138
Filter1-
Operator_1
Filter2-
Operator_1
132D
140
APT_Funnel-
Operator_1
132G
RemoveDupli-
catesOperator_1
132K
APT_BasicSta-
tisticsOperator_1
132V
134B
customerDS
APT_Basic-
Statistcs-
Results_1
136

FIG. #3

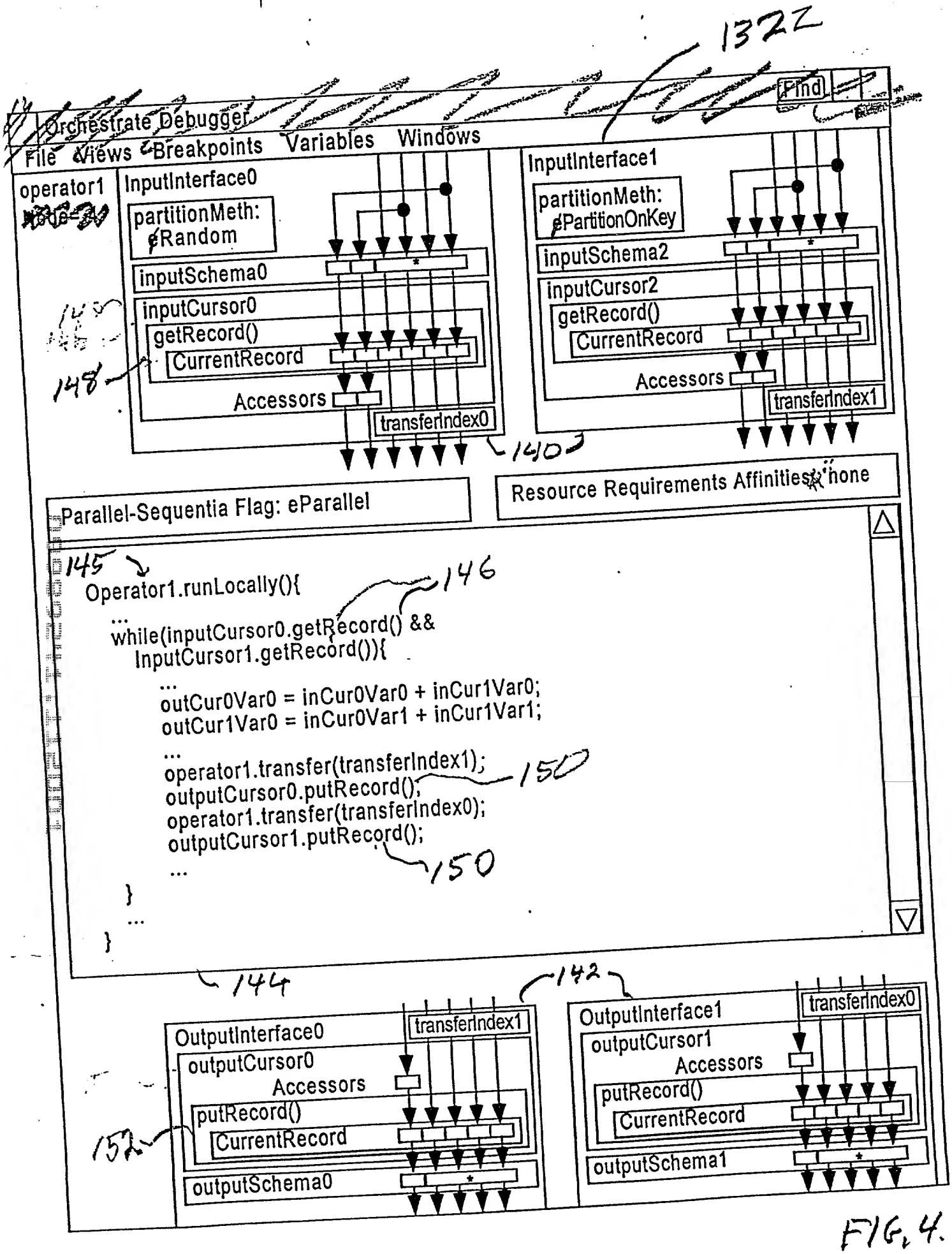

Orchestrate Debugger
File Views Breakpoints Variables Windows
Find
operator1
InputInterface0
partitionMeth: eRandom
inputSchema0
inputCursor0
getRecord()
CurrentRecord
Accessors
transferIndex0
InputInterface1
partitionMeth: ePartitionOnKey
inputSchema2
inputCursor2
getRecord()
CurrentRecord
Accessors
transferIndex1
Parallel-Sequentia Flag: eParallel
Resource Requirements Affinities: none
Operator1.runLocally(){
...
while(inputCursor0.getRecord() &&
InputCursor1.getRecord()){
...
outCur0Var0 = inCur0Var0 + inCur1Var0;
outCur1Var0 = inCur0Var1 + inCur1Var1;
...
operator1.transfer(transferIndex1);
outputCursor0.putRecord();
operator1.transfer(transferIndex0);
outputCursor1.putRecord();
...
}
...
}
OutputInterface0
transferIndex1
outputCursor0
Accessors
putRecord()
CurrentRecord
outputSchema0
OutputInterface1
transferIndex0
outputCursor1
Accessors
putRecord()
CurrentRecord
outputSchema1

FIG. 4.

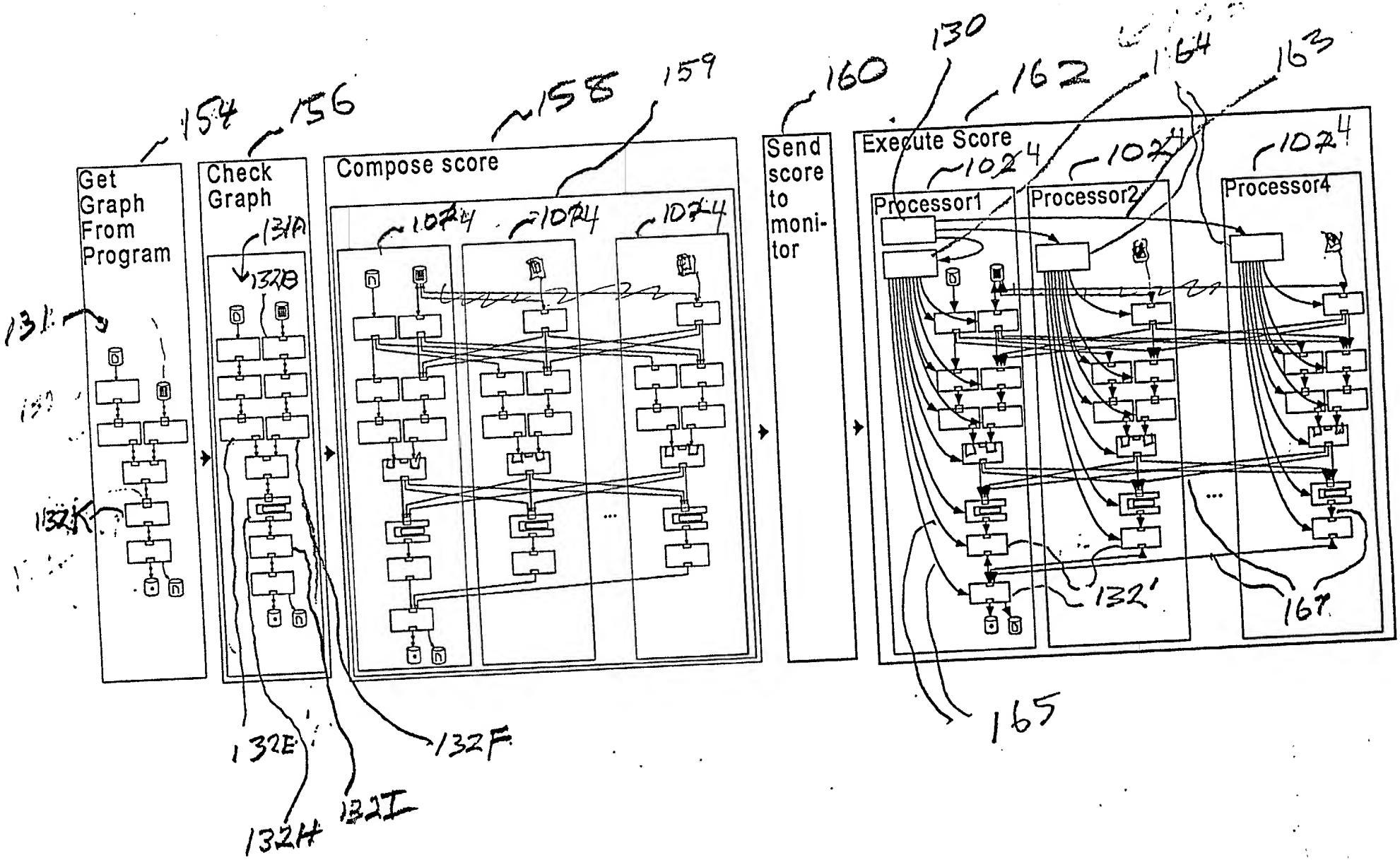


FIG. 5

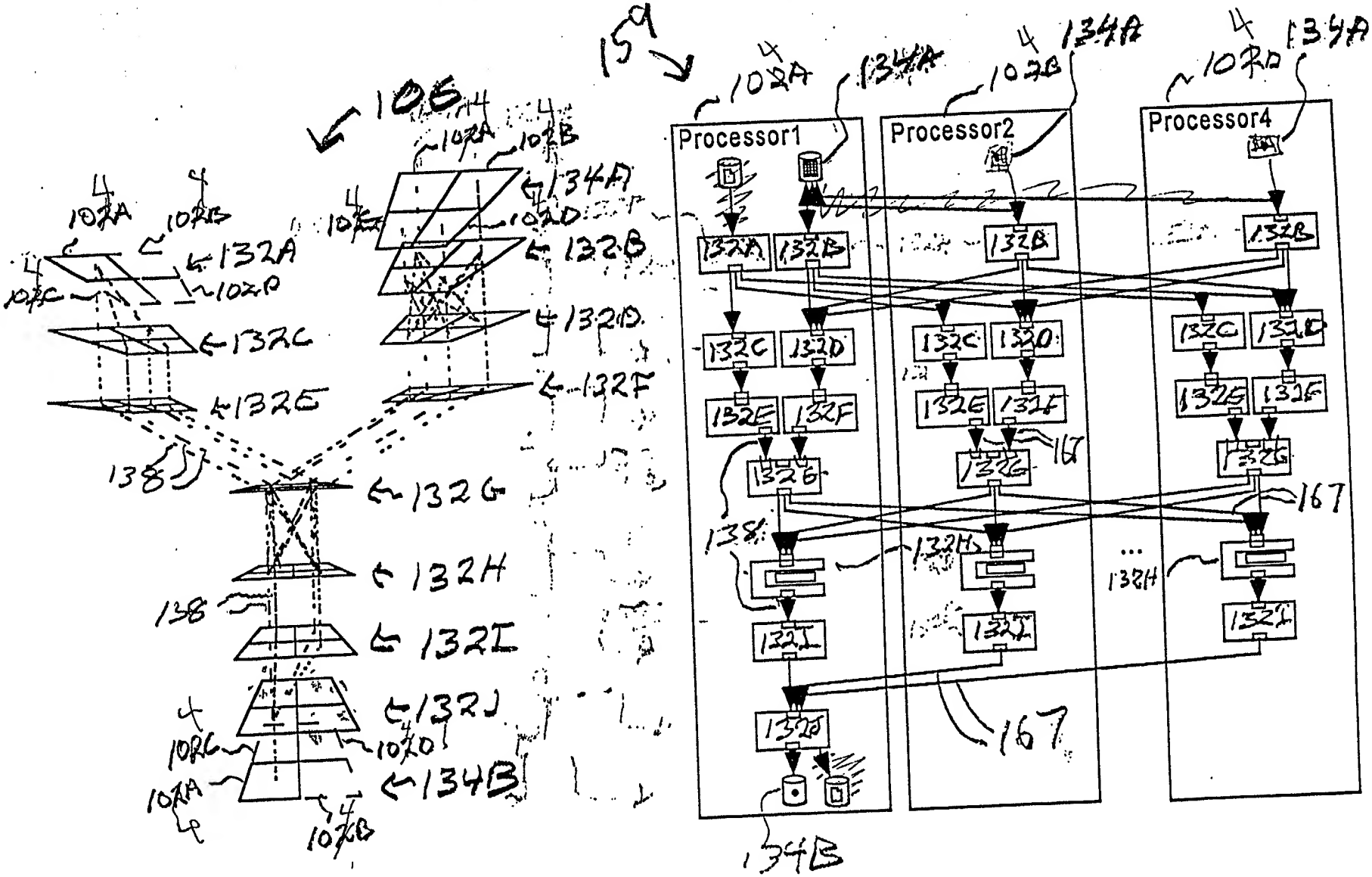


FIG. 6

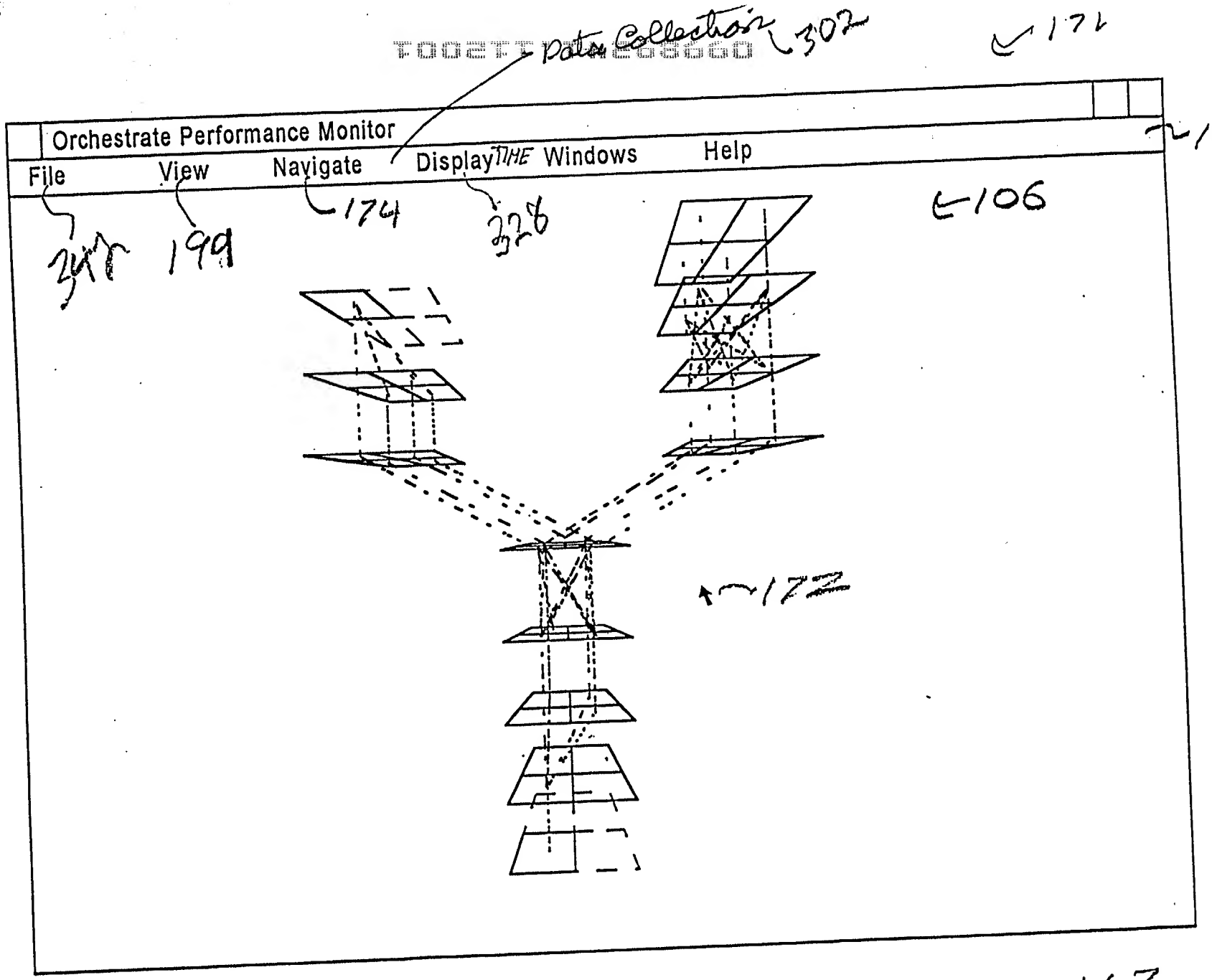

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
199
174
226
106
122
170
172
302

FIG 7

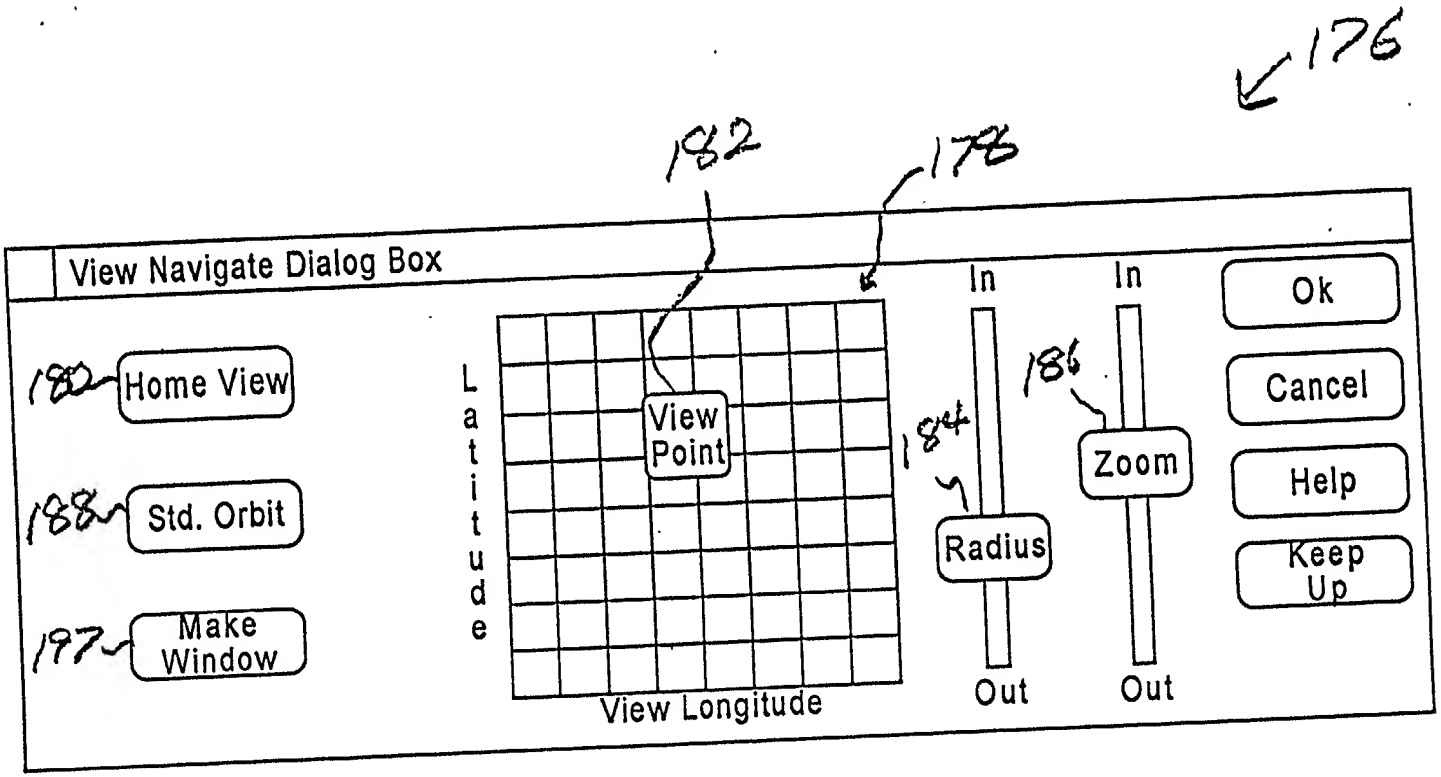


FIG. 8

-View Menu~198
- -2D Views~200
  - -By Instances~216
  - -By Operators~218
  - -...
- -3D Views~202
  - -Expansion Level~220
    - -By Instances~228
    - -By Operators~230
    - -By Levels~232
    - -By Processors~234
    - -By System~236
  - -...
- -Display Ports~203
- -Datalink Display~204
- -Labels~205
  - -No Labels~~268~~ 254
  - -Name Only~~270~~ 255
  - -Block Diagram~272
- -Bar Graphs~207
- -Number Processors~206
- -Get & Put Hangs~210
- -EOF Display~211
- -Monitored field~212
- -Saved Visualization Manager~213

Fig. 9

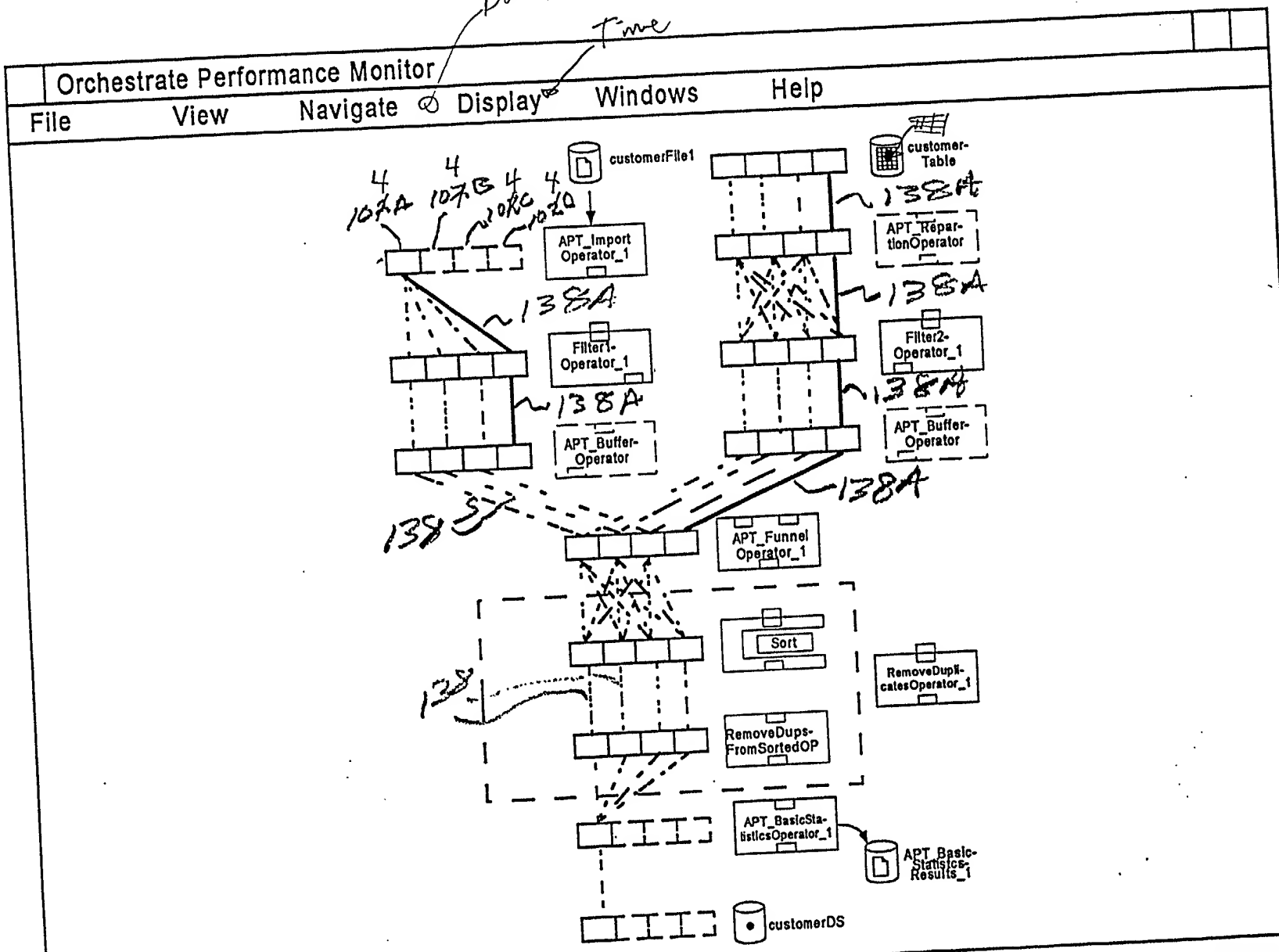

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
customerFile1
customer-Table
APT_Import Operator_1
APT_Repar-tionOperator
Filter1-Operator_1
Filter2-Operator_1
APT_Buffer-Operator
APT_Buffer-Operator
APT_Funnel Operator_1
Sort
RemoveDupli-catesOperator_1
RemoveDups-FromSortedOP
APT_BasicSta-tisticsOperator_1
APT_Basic-Statistics-Results_1
customerDS

FIG. 1
FIG. 10

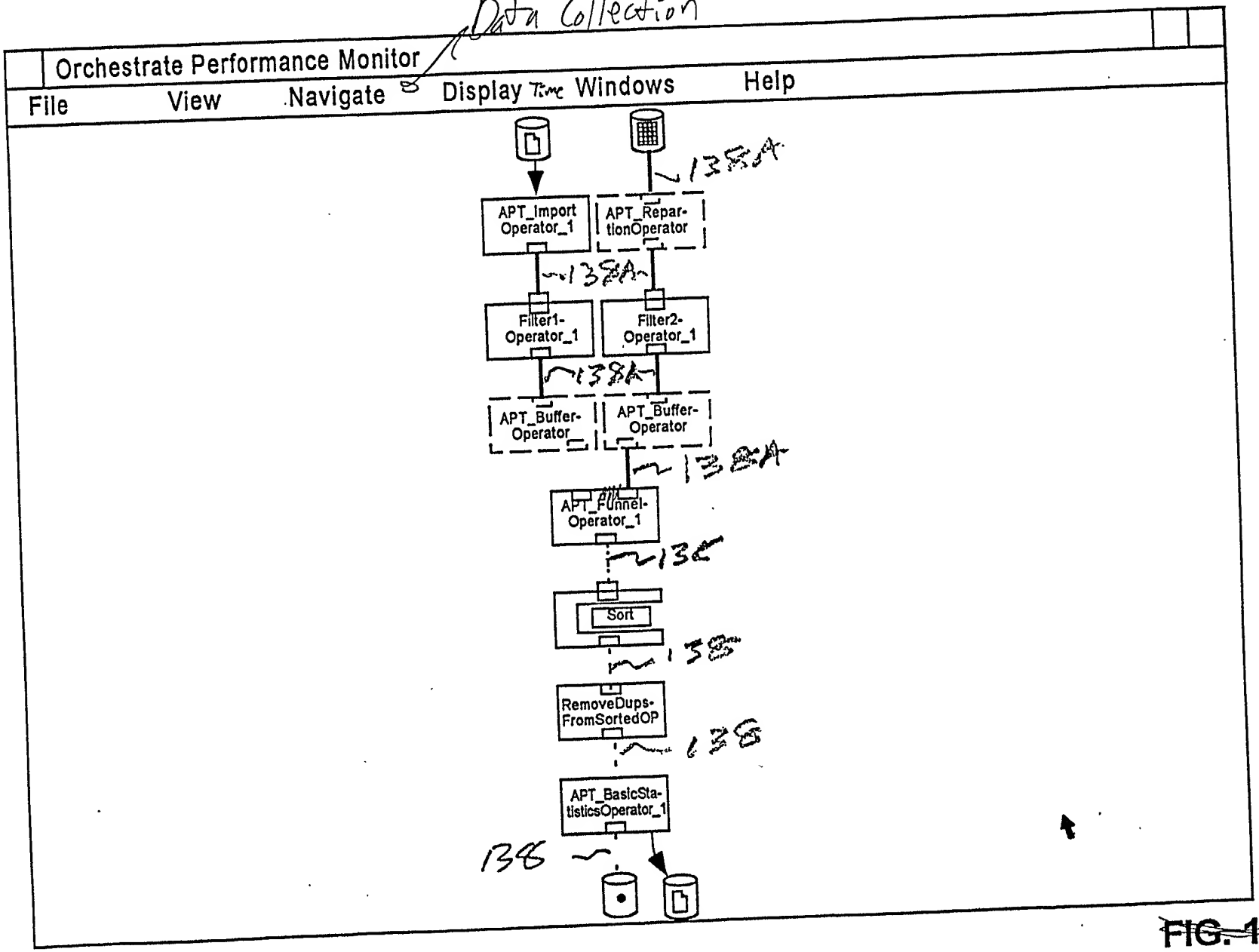


FIG. 1

FIG 11

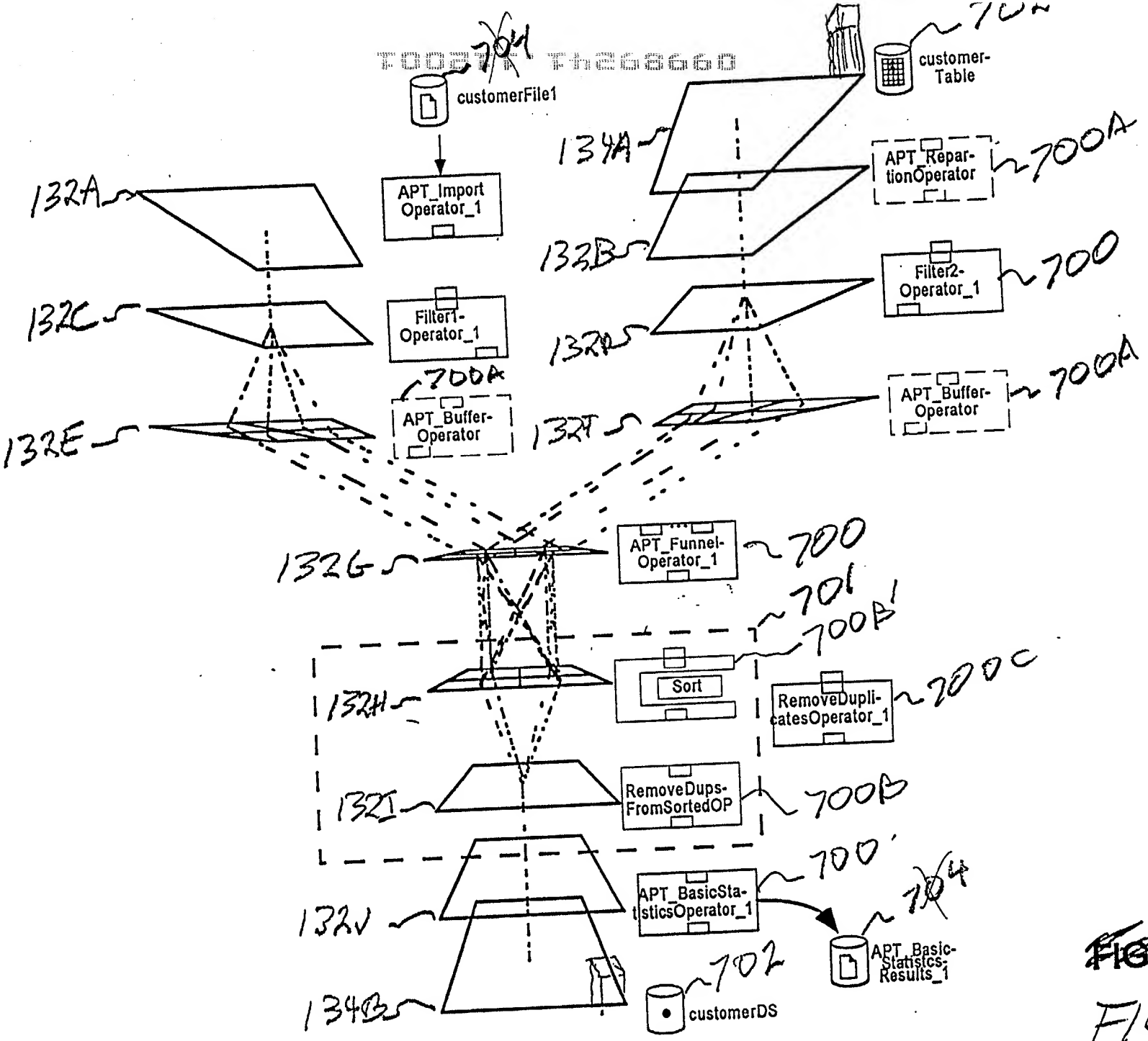
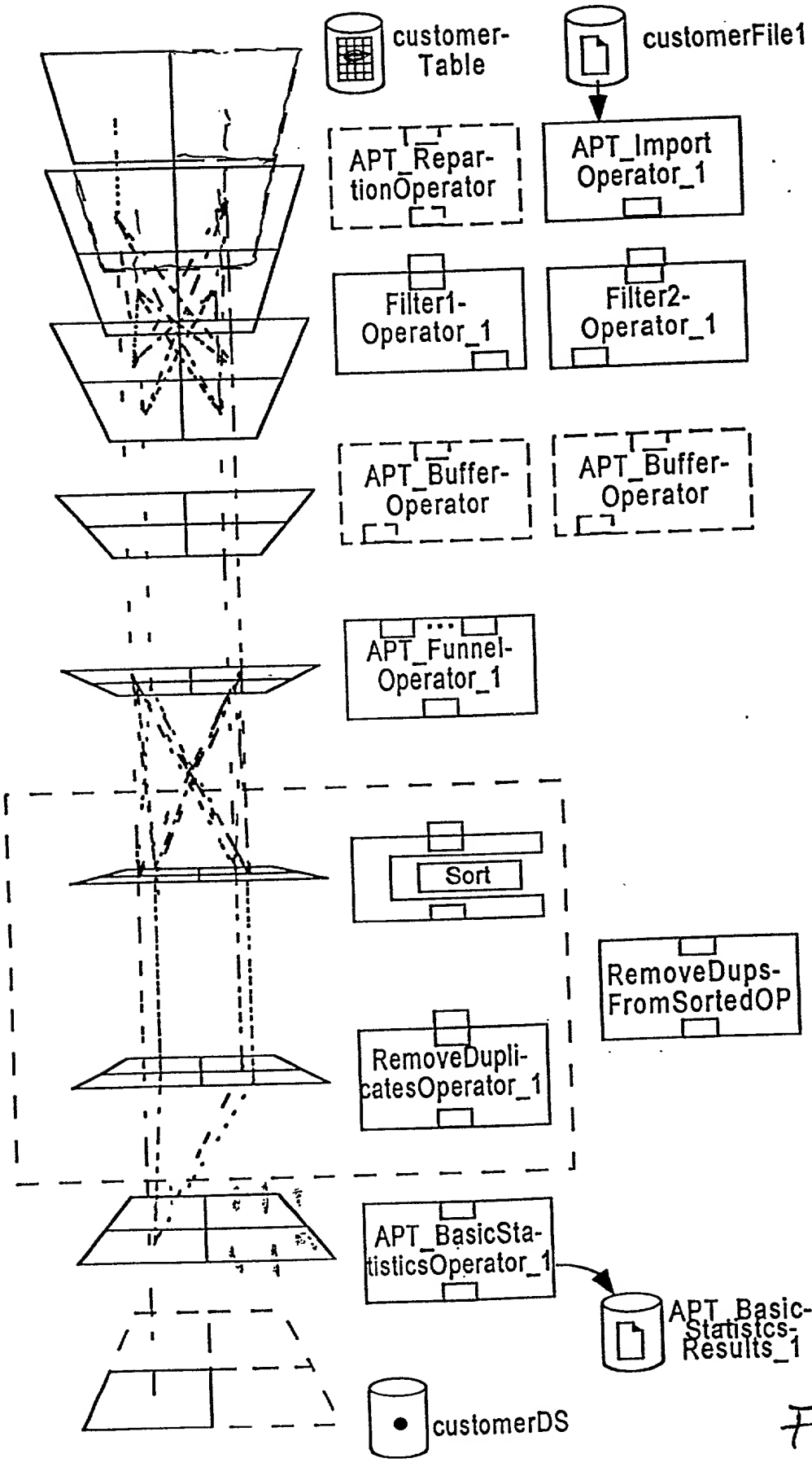

customerFile1
APT_Import Operator_1
132A
132C
Filter1-Operator_1
700A
APT_Buffer-Operator
132E
customer-Table
134A
APT_Repar-tionOperator
700A
133B
Filter2-Operator_1
700
132D
APT_Buffer-Operator
700A
132F
APT_Funnel-Operator_1
700
132G
701
700B
Sort
132H
RemoveDupli-catesOperator_1
700C
RemoveDups-FromSortedOP
132I
700B
700
APT_BasicSta-tisticsOperator_1
132V
704
APT_Basic-Statistics-Results_1
134B
702
customerDS

FIG. 7

FIG 12


customer-
Table
customerFile1
APT_Repar-
tionOperator
APT_Import
Operator_1
Filter1-
Operator_1
Filter2-
Operator_1
APT_Buffer-
Operator
APT_Buffer-
Operator
APT_Funnel-
Operator_1
Sort
RemoveDups-
FromSortedOP
RemoveDupli-
catesOperator_1
APT_BasicSta-
tisticsOperator_1
APT_Basic-
Statistcs-
Results_1
customerDS

F1613

Data Collection

Orchestrate Performance Monitor

File View Navigate Display Time Windows Help

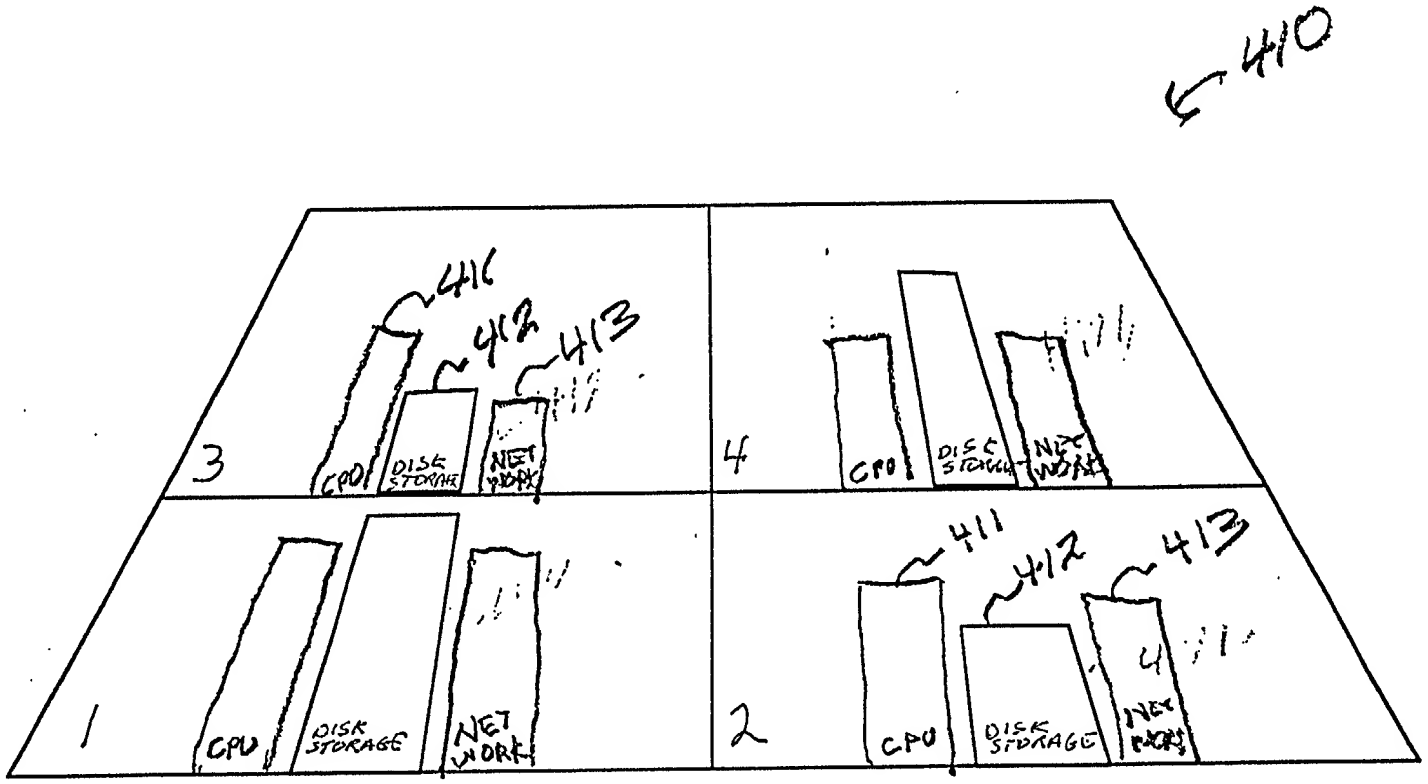


FIG. 1
FIG 1A

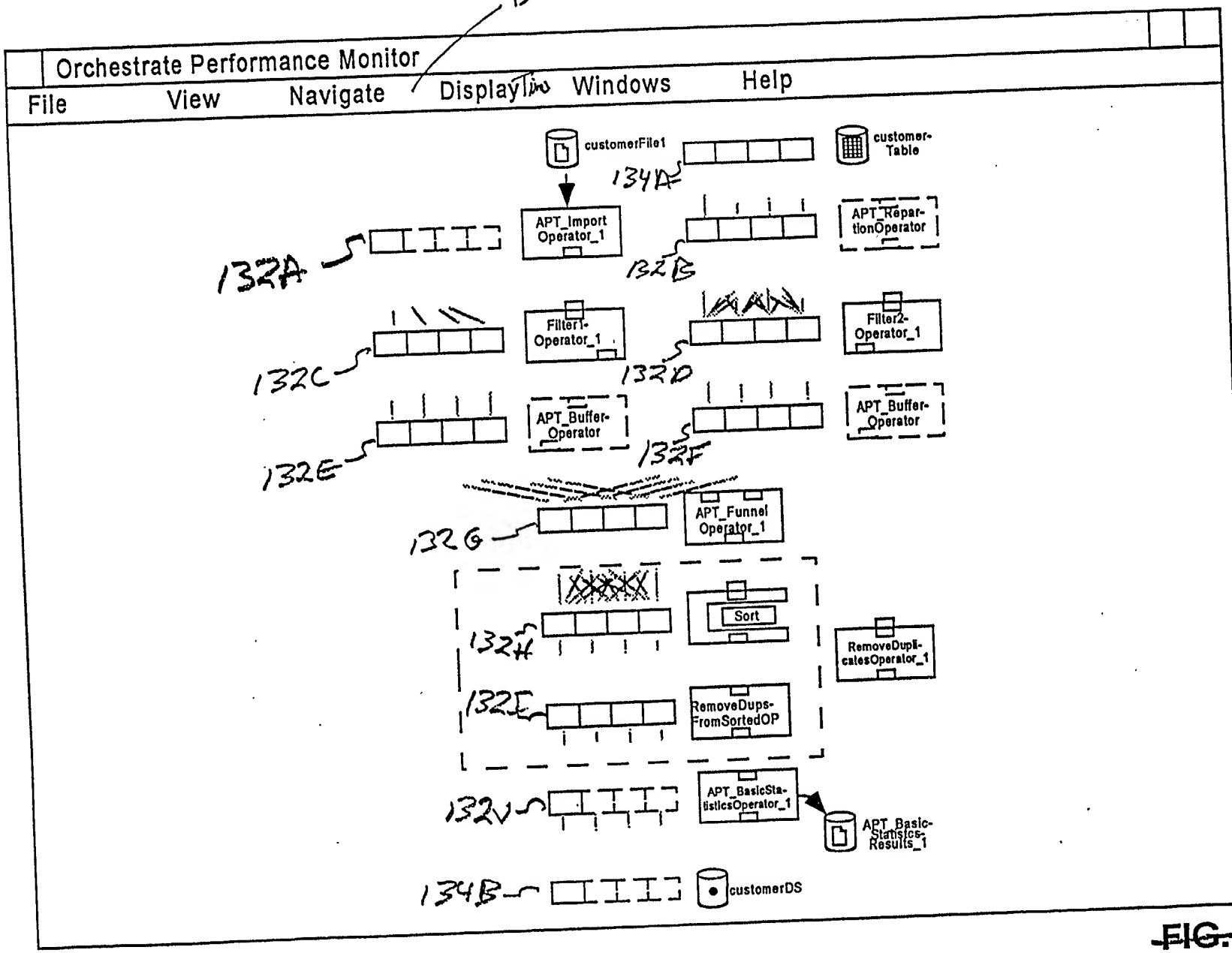

Display Elements
Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
customerFile1
customer-Table
134A
APT_Import Operator_1
APT_Repar-tionOperator
132A
132B
Filter1-Operator_1
Filter2-Operator_1
132C
132D
APT_Buffer-Operator
APT_Buffer-Operator
132E
132F
APT_Funnel Operator_1
132G
Sort
RemoveDupli-catesOperator_1
132H
132E
RemoveDups-FromSortedOP
APT_BasicSta-tisticsOperator_1
APT_Basic-Statistics-Results_1
132V
134B
customerDS

FIG. 1
FIG 1

-barGraphDisplayDialogBox3~238
- -bar graphs on
  - -[ ] persistent data set~240
  - -[ ] buffer operator~241
  - -[ ] operator~242
- - graph
  - -show~243
    - -flow rate in ( ) bytes, or ( ) record ~244
      - -[ ] outputs and/or [ ] inputs
    - -total flow to date in ( ) bytes, or ( )records~245
      - -[ ] outputs and/or [ ] inputs
      - -[ ] relative to total records in input data set~245A
    - -disk I/O rate in ( ) bytes or ( ) records~246
      - ( ) plain, ( ) % of maximum, or ( ) compared to remaining
    - -network I/O rate in ( ) bytes or ( ) records~248
      - ( ) plain, ( ) % of maximum, or ( ) compared to remaining
    - -[ ] disk storage as in bytes ~250
      - ( ) plain, ( ) % of maximum, or ( ) compared to remaining
    - -[ ] CPU usage as % of maximum~251
      - ( ) plain, ( ) % of maximum, or ( ) compared to remaining
  - -direction~252
    - -( ) perpendicular to node array
    - -( ) on surface of each node
- -[ ] label scale on graphs~258
- -ok
- -cancel
- -help

FIG. 16

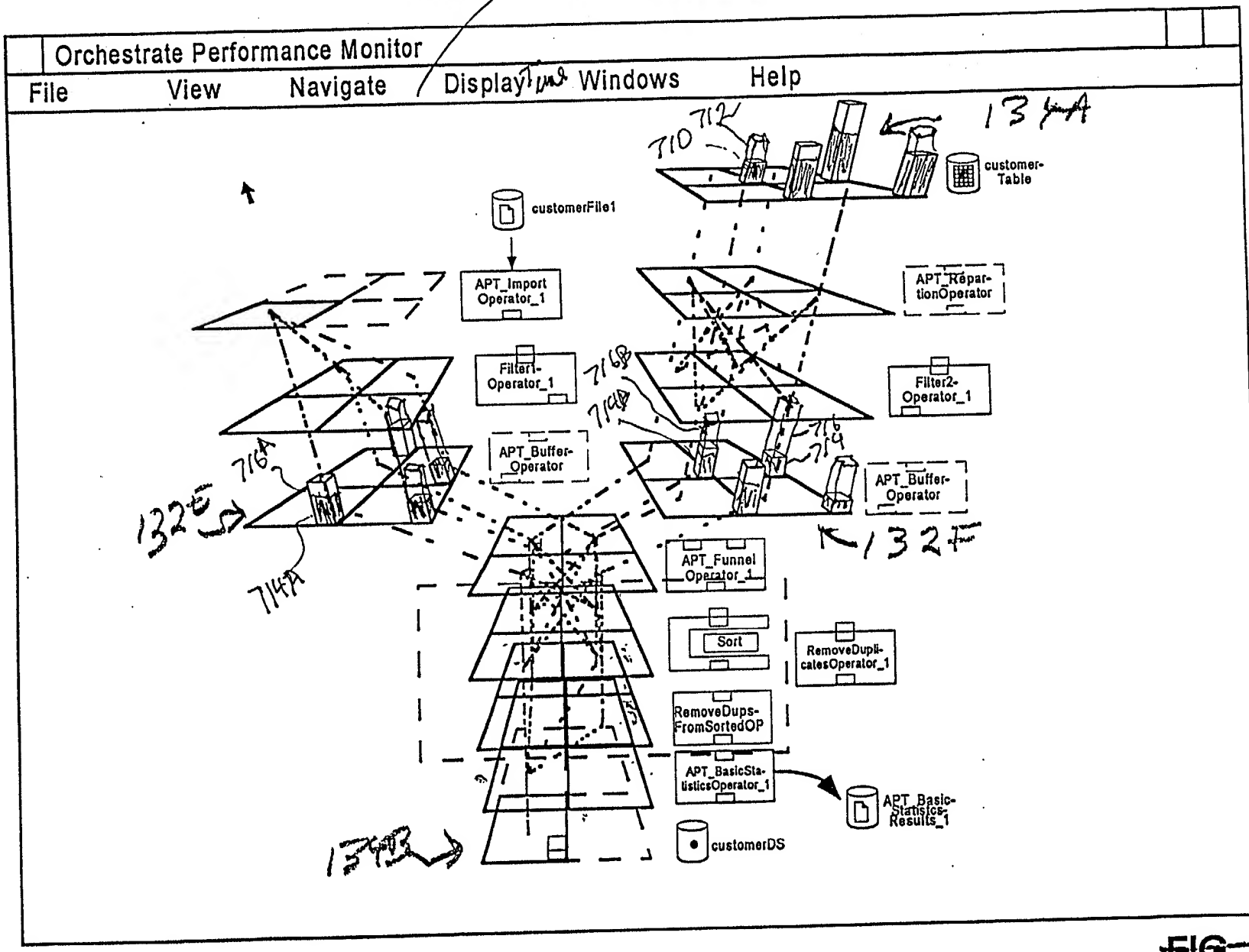


FIG. 1
FIG 1

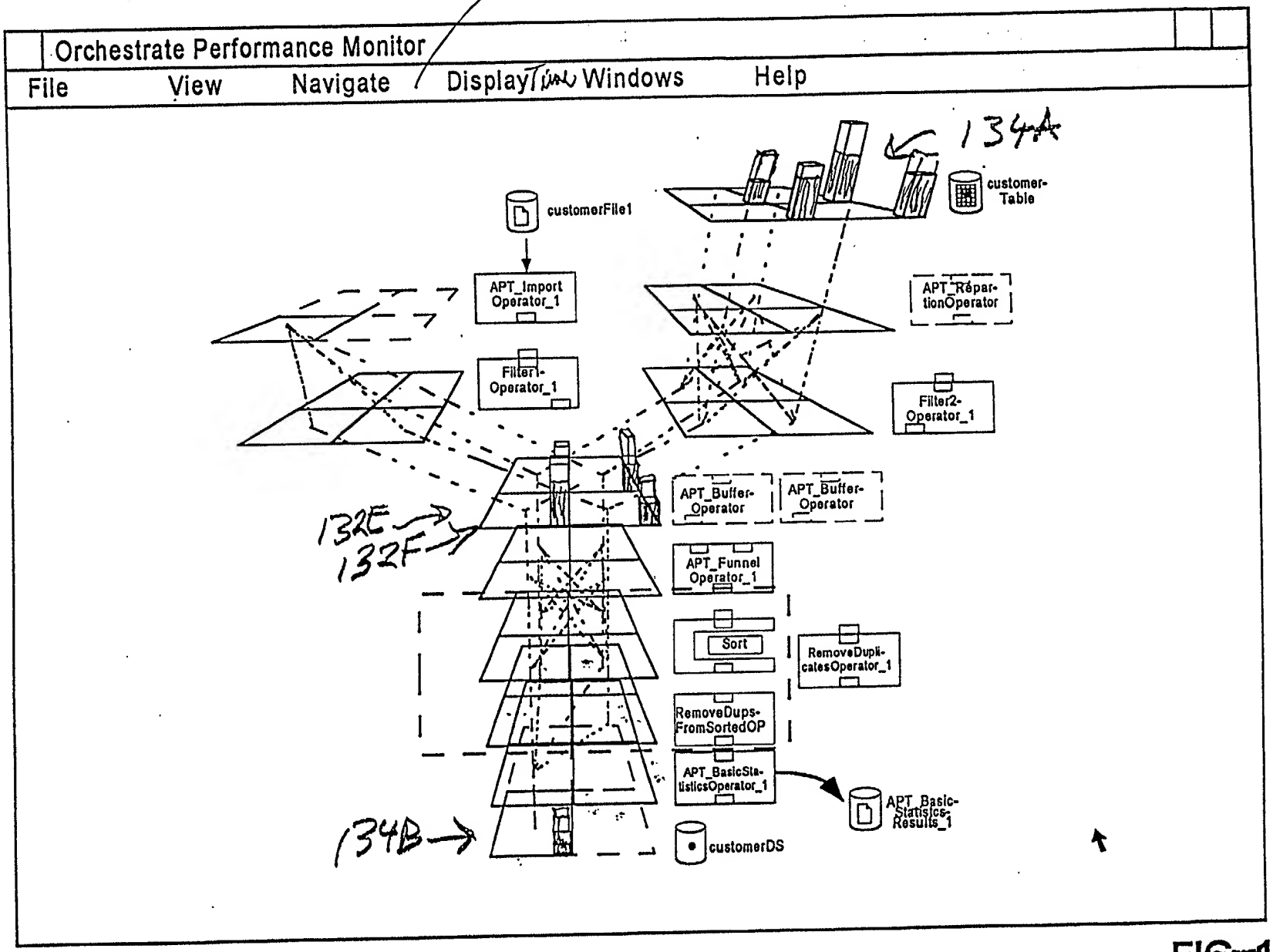

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
134A
customer-Table
customerFile1
APT_Import Operator_1
APT_RépartitionOperator
Filter1-Operator_1
Filter2-Operator_1
APT_Buffer-Operator
APT_Buffer-Operator
132E
132F
APT_Funnel Operator_1
Sort
RemoveDuplicatesOperator_1
RemoveDups-FromSortedOP
APT_BasicStatisticsOperator_1
APT_Basic-Statistics-Results_1
134B
customerDS

FIG. 1

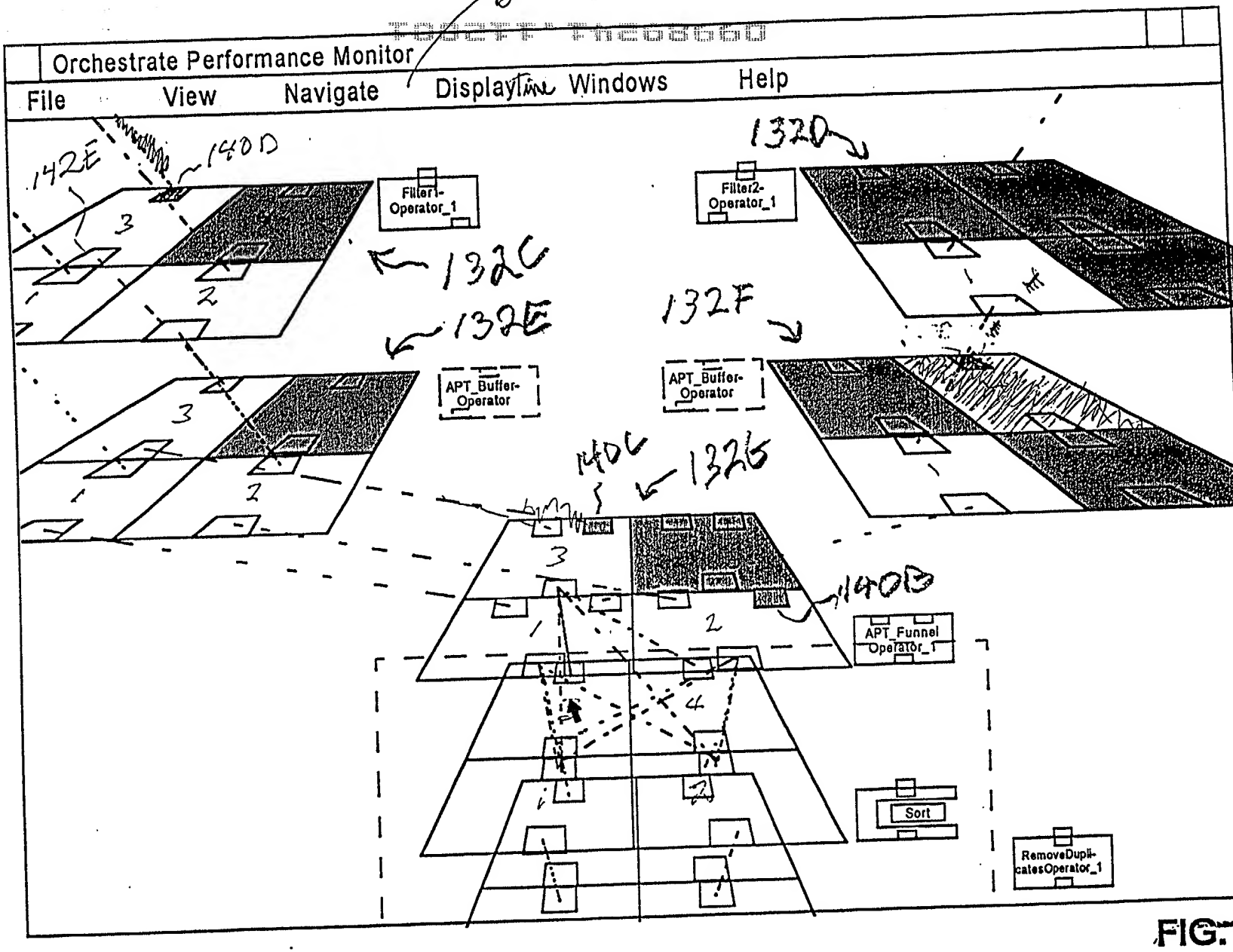

Data Collector
Orchestrate Performance Monitor
File
View
Navigate
Display
Time Windows
Help
142E
140D
1320
Filter1-Operator_1
Filter2-Operator_1
132C
132E
132F
APT_Buffer-Operator
APT_Buffer-Operator
140C
1325
140D
APT_Funnel Operator_1
Sort
RemoveDupli-catesOperator_1

FIG. 1

F1G19

- datalinkDisplayDialogBox~260
    - -[ ] display datalinks~261
    - -color data link by~263
        - -source ( ) node or ( ) operator~264A
        - -destination ( ) node or ( ) operator~264B
        - -flow rate in ( ) records or ( ) bytes~264C
        - -inverse flow rate in ( ) records or ( ) bytes~264D
        - -total records sent in ( ) records or ( ) bytes~264E
        - -inverse of total records sent in ( ) records or ( ) bytes~264F
        - -( ) partition method~264G
        - -monitored field value
            - -by ( ) 1st letter, ( ) 1st number, or ( ) color map~264H
            - -monitored field settings (button)~265
    - -segmentation
        - -( ) solid~266A
        - -data rate rain by
            - -( ) records/sec or ( ) bytes/sec~266B
        - -( ) color history ~266C
            - -( ) show entire time of graph execution along datalink~267A
            - -( ) show [editbox] secs along datalink~267B
            - -separately color every [editbox] secs~267C
            - -[ ] show time scale along datalinks (checkbox)~267D
    - -color map dialog (button)~268
    - -flow rate time frame~269
        - -( ) avg in last second
        - -( ) avg in last minute
        - -( ) avg in last [edit box] sec
    - -ok
    - -cancel
    - -help

FIG. 20

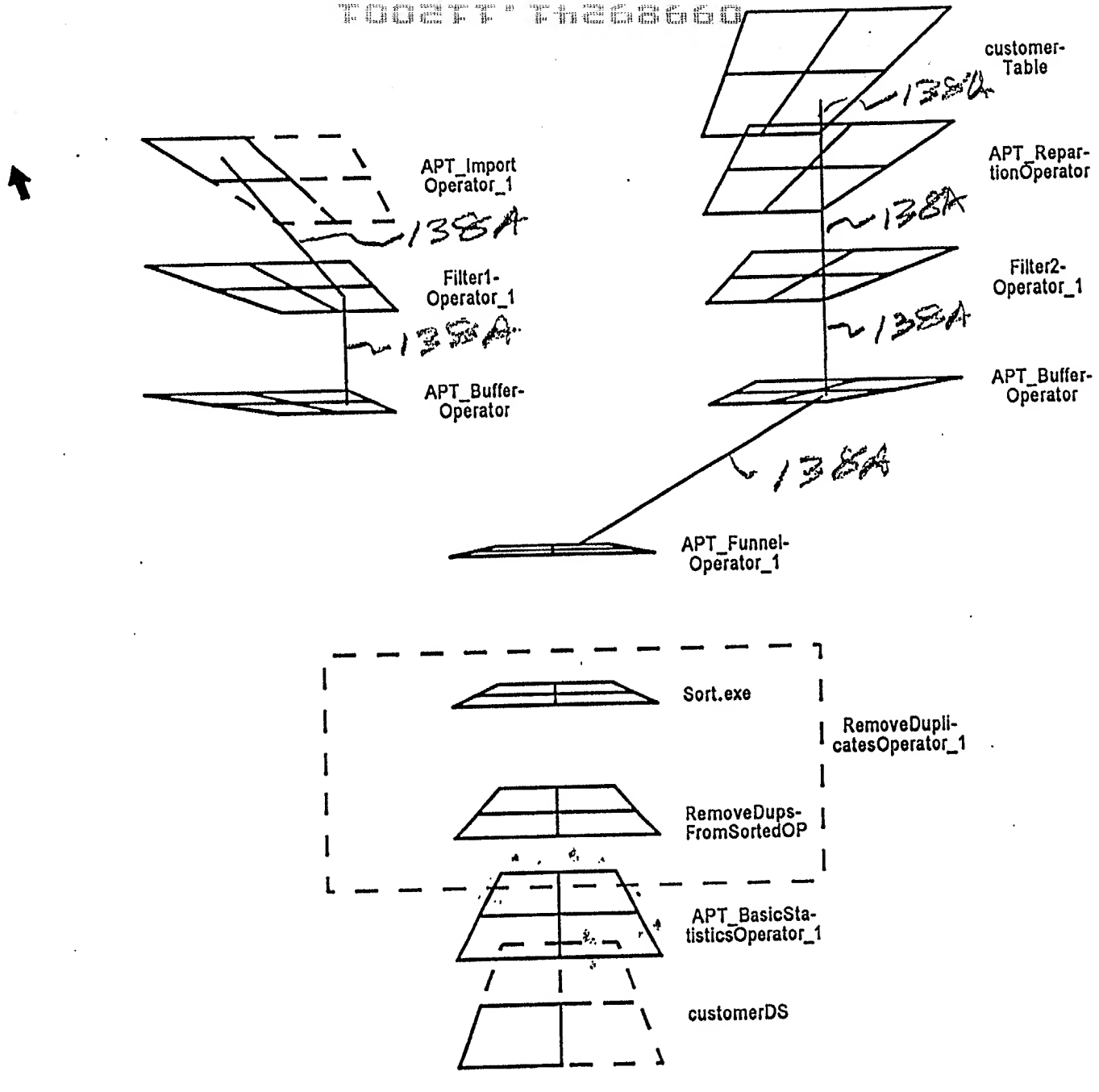

customer-
Table
APT_Repar-
tionOperator
Filter2-
Operator_1
APT_Buffer-
Operator
APT_Import
Operator_1
Filter1-
Operator_1
APT_Buffer-
Operator
APT_Funnel-
Operator_1
Sort.exe
RemoveDupli-
catesOperator_1
RemoveDups-
FromSortedOP
APT_BasicSta-
tisticsOperator_1
customerDS

FIG. 1
FIG. 2

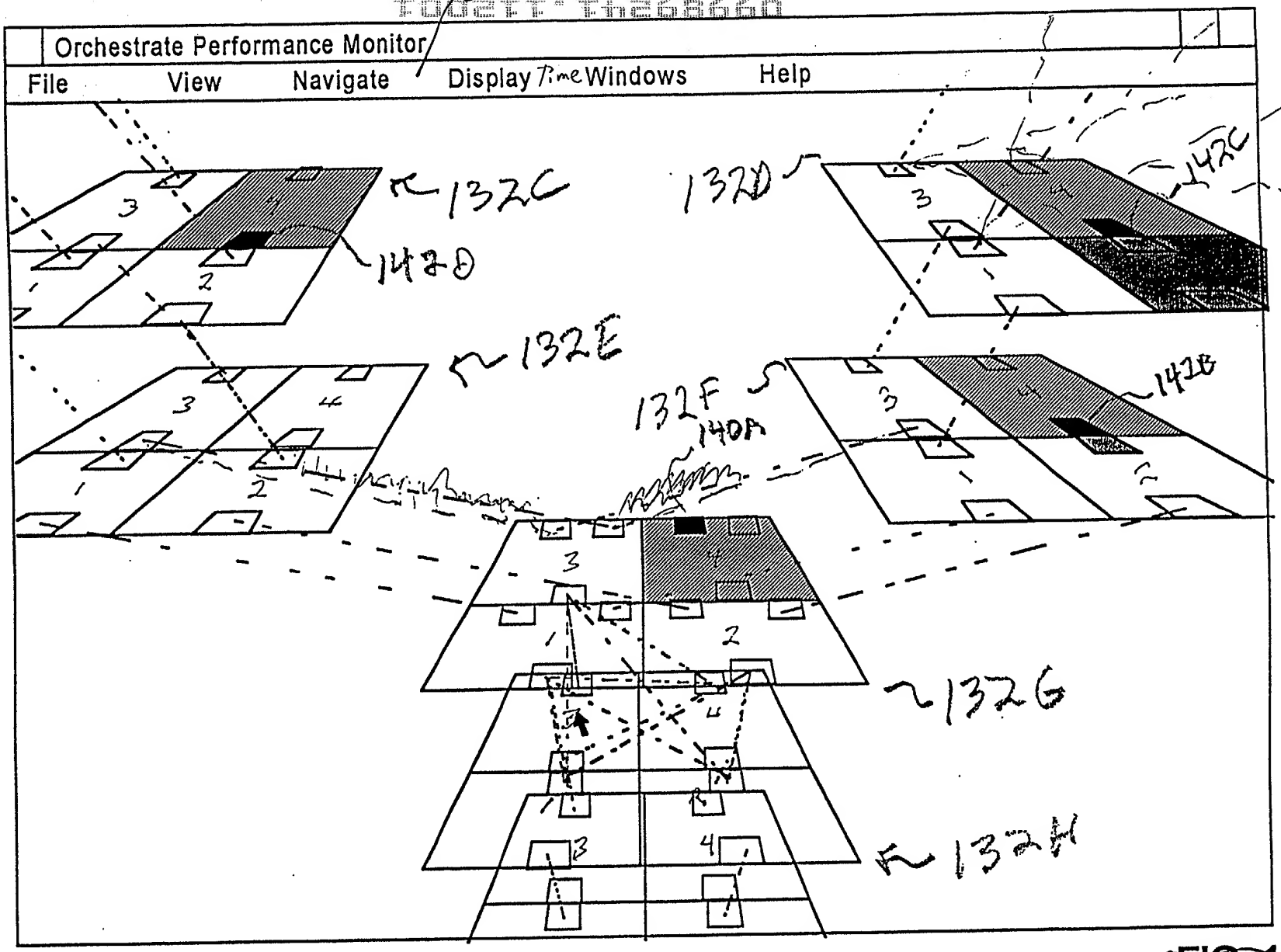

Data Collection
Orchestrate Performance Monitor
File
View
Navigate
Display Time Windows
Help
132C
142D
132D
142C
TO INDICATE PARTITIONED DATA FLOW
132E
132F
140A
142B
132G
132H

FIG. 1

FIG. 2

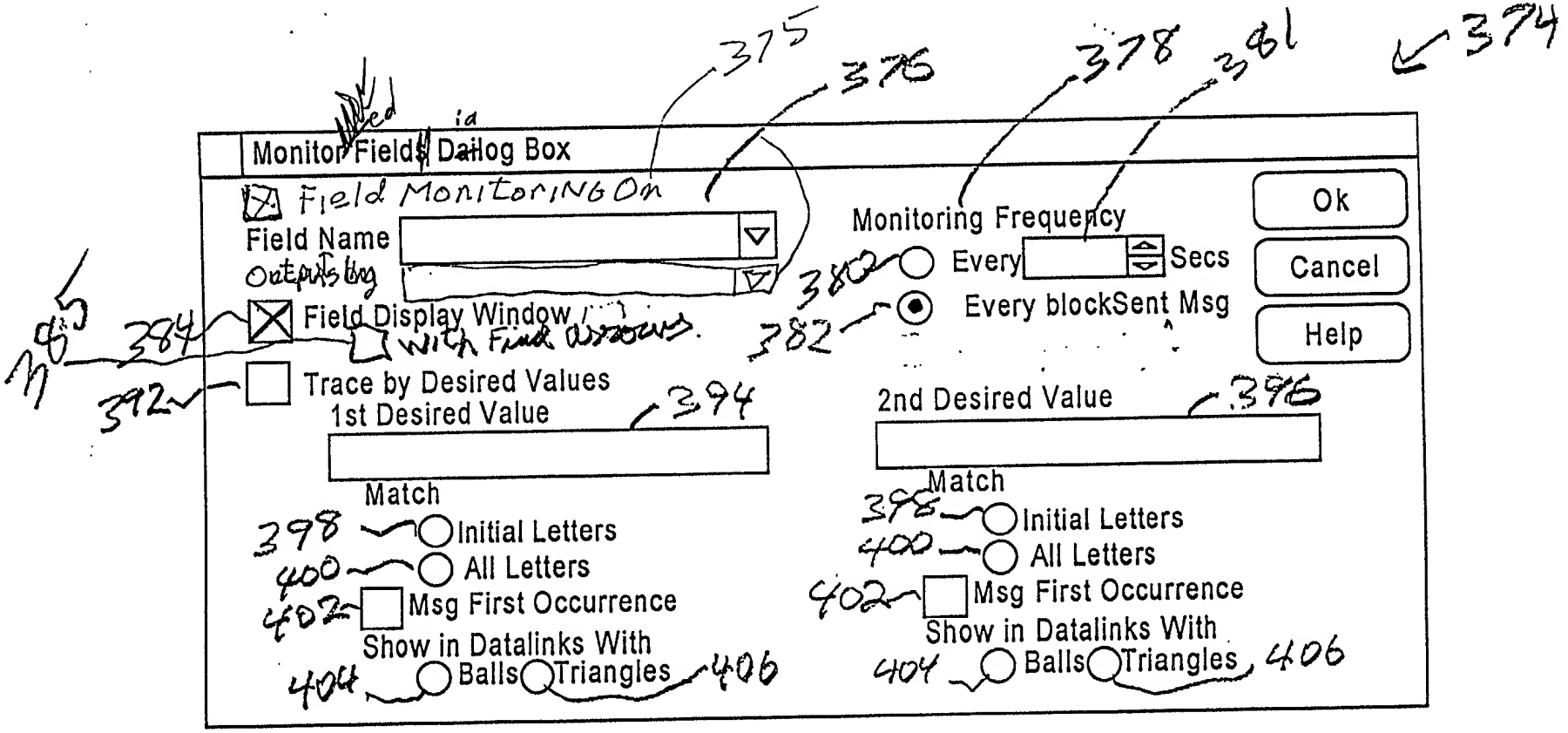


FIG. 24

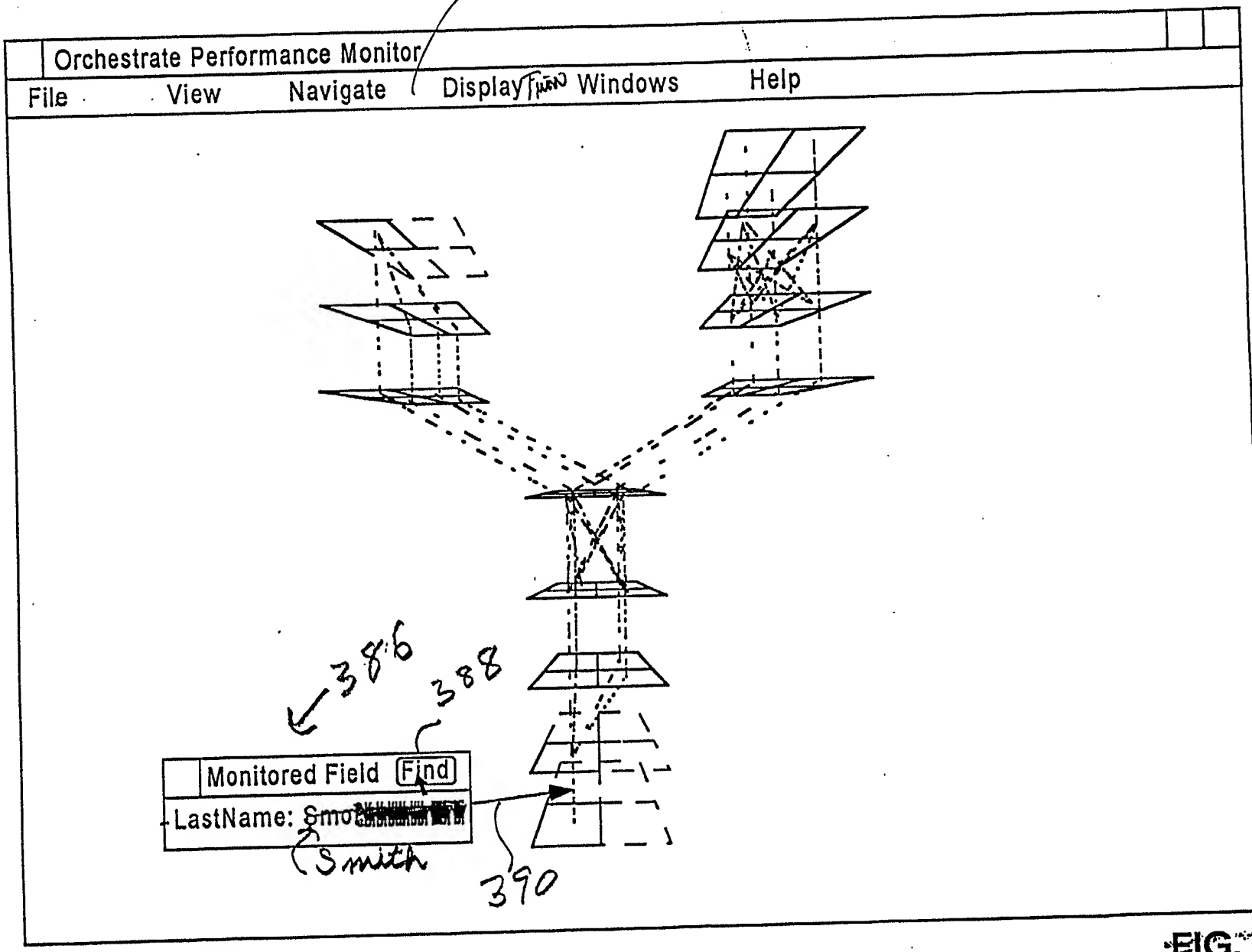

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
386
388
Monitored Field
Find
LastName:
Smith
390

FIG. 1
FIG 25

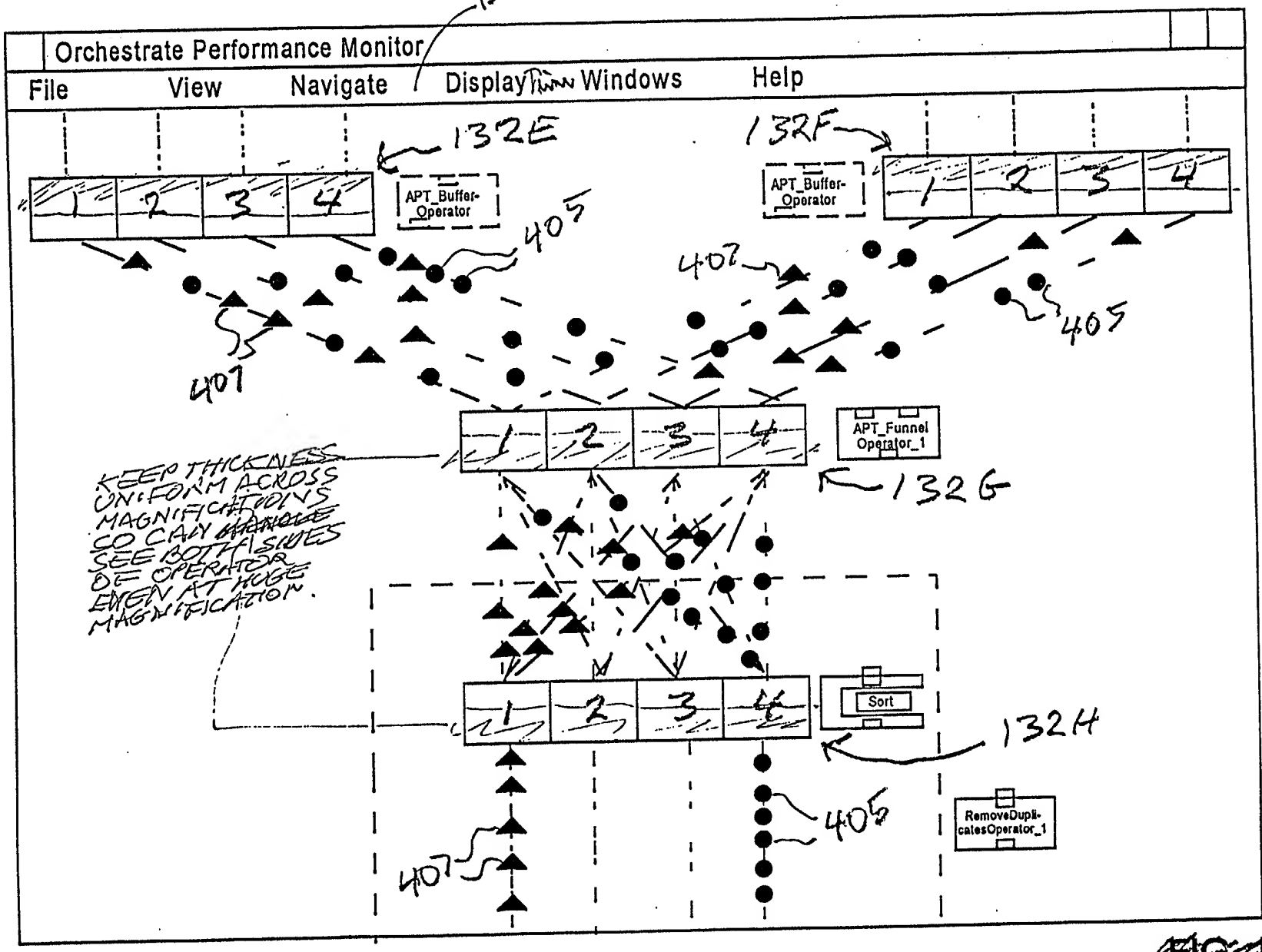

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
132E
132F
APT_Buffer-Operator
APT_Buffer-Operator
405
407
407
405
APT_Funnel Operator_1
132G
KEEP THICKNESS UNIFORM ACROSS MAGNIFICATIONS SO CAN SEE BOTH ISUES OF OPERATOR EVEN AT HUGE MAGNIFICATION.
Sort
132H
405
407
RemoveDupli-catesOperator_1

FIG 26

-getAndPutHangsDialogBox~266
-[ ] monitor get and put hangs~~268~~ 271
-consider call hung after [editbox] secs~270
-highlight~272
-[ ] port with hung call~274
-[ ] hung operator instances~276
-[ ] hung datalinks~278
-[ ] don't highlight hangs for ports which have not handled any records~279
-color hung getRecords as solid [color button grid]~280
-color hung putRecords as solid [color button grid]~282
-[ ] display time of hang~284
-ok
-cancel
-help

FIG. 23

-EOFDisplayDialogBox~290
-display EOFs by
-[ ] port~292
-[ ] operator~294
-[ ] datalink~296
-highlight EOFed objects as solid [color button grid]~298
-[ ] display time of EOF~300
-ok
-cancel
-help

FIG. 27

-DataCollection Menu~304
-record performance~306
-not at all~312
-every second~314
-every minute~316
-custom~318
-monitor performance~308
-not at all~320
-every second~322
-every minute~324
-custom~326
-...

FIG. 28

-DisplayTime Menu~330
-realtime~332
-replay~334
-...

FIG. 29

-replayDialogBox~336
-time slider~338
-replay speed slider~340
-...
-ok
-cancel
-help

FIG. 30

-operator objectMenu~~342~~ 343
-make focus and nav~354
-collapse instances~356
-collapse operators at level~355
-object overview~358
-performance overview~360
-datalink display~362
-bar graph~368
-monitored fields~370
-...

FIG. 31

-operator port objectMenu~344
-make focus and nav~354
-collapse instances~356
-object overview~358
-performance overview~360
-datalink display~362
-bar graph~368
-monitored fields~370
-monitor records~372
-...

FIG. 32

-operator instance objectMenu~346
-make focus and nav~354
-collapse instances~356
-debug~357
-object overview~358
-performance overview~360
-datalink display~362
-bar graph~368
-monitored fields~370
-...

FIG. 33

-operator port instance objectMenu~348
-make focus and nav~354
-collapse instances~356
-debug~357
-object overview~358
-performance overview~360
-datalink display~362
-bar graph~368
-monitored fields~370
-monitor records~372
-...

FIG. 34

-datalink objectMenu~350
-make focus and nav~354
-collapse instances~356
-object overview~358
-performance overview~360
-datalink display~362
-monitored fields~370
-monitor records~372
-...

FIG. 35

-datalink instance objectMenu~352
-make focus and nav~354
-collapse instances~356
-debug~357
-object overview~358
-performance overview~360
-datalink display~362
-monitored fields~370
-monitor records~372
-...

FIG. 36

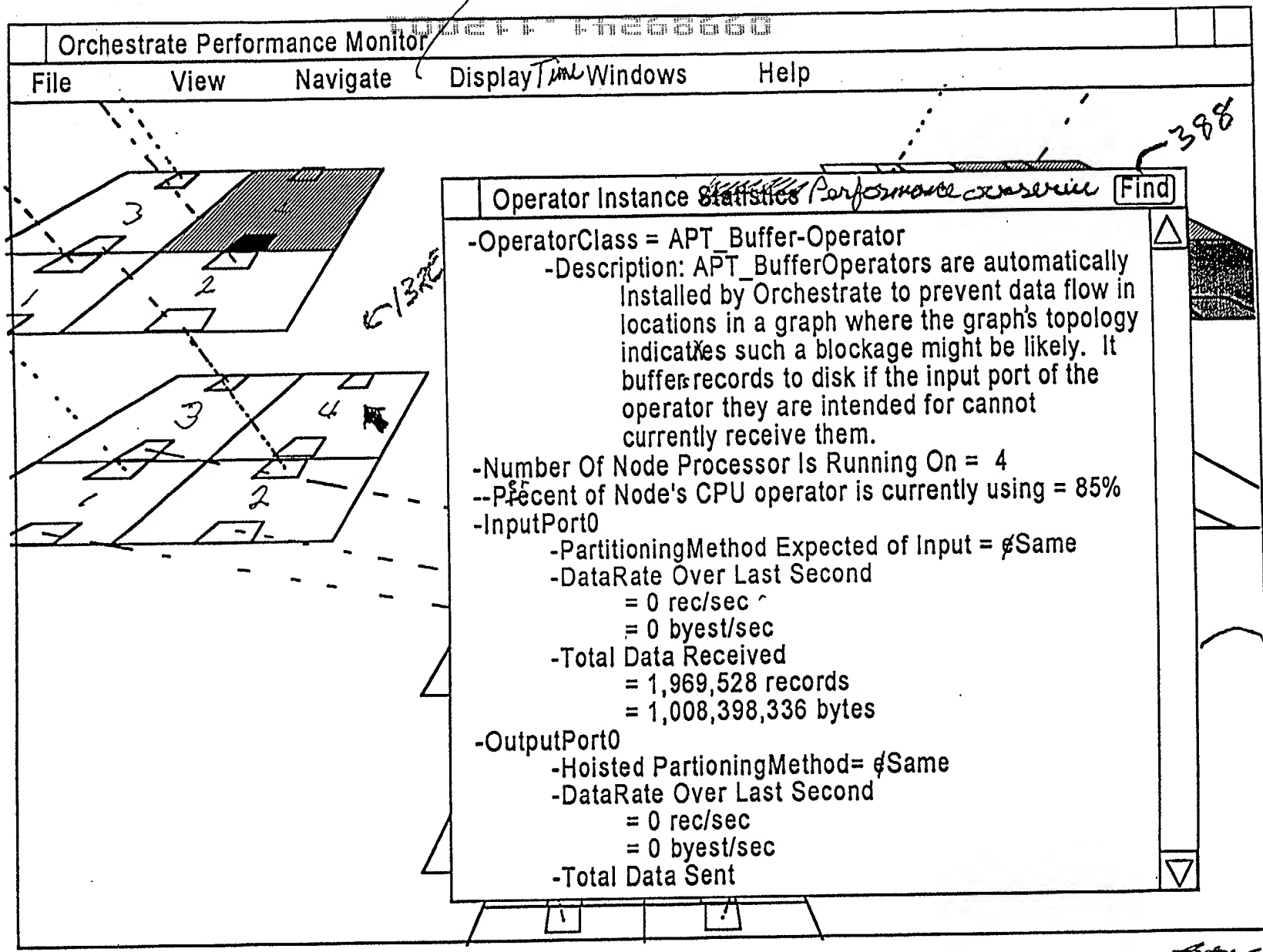

Orchestrate Performance Monitor
File
View
Navigate
Display
Windows
Help
Operator Instance Statistics
Find
-OperatorClass = APT_Buffer-Operator
-Description: APT_BufferOperators are automatically Installed by Orchestrate to prevent data flow in locations in a graph where the graph's topology indicates such a blockage might be likely. It buffers records to disk if the input port of the operator they are intended for cannot currently receive them.
-Number Of Node Processor Is Running On = 4
--Percent of Node's CPU operator is currently using = 85%
-InputPort0
-PartitioningMethod Expected of Input = Same
-DataRate Over Last Second
= 0 rec/sec
= 0 byest/sec
-Total Data Received
= 1,969,528 records
= 1,008,398,336 bytes
-OutputPort0
-Hoisted PartioningMethod= Same
-DataRate Over Last Second
= 0 rec/sec
= 0 byest/sec
-Total Data Sent

FIG. 1
FIG 3

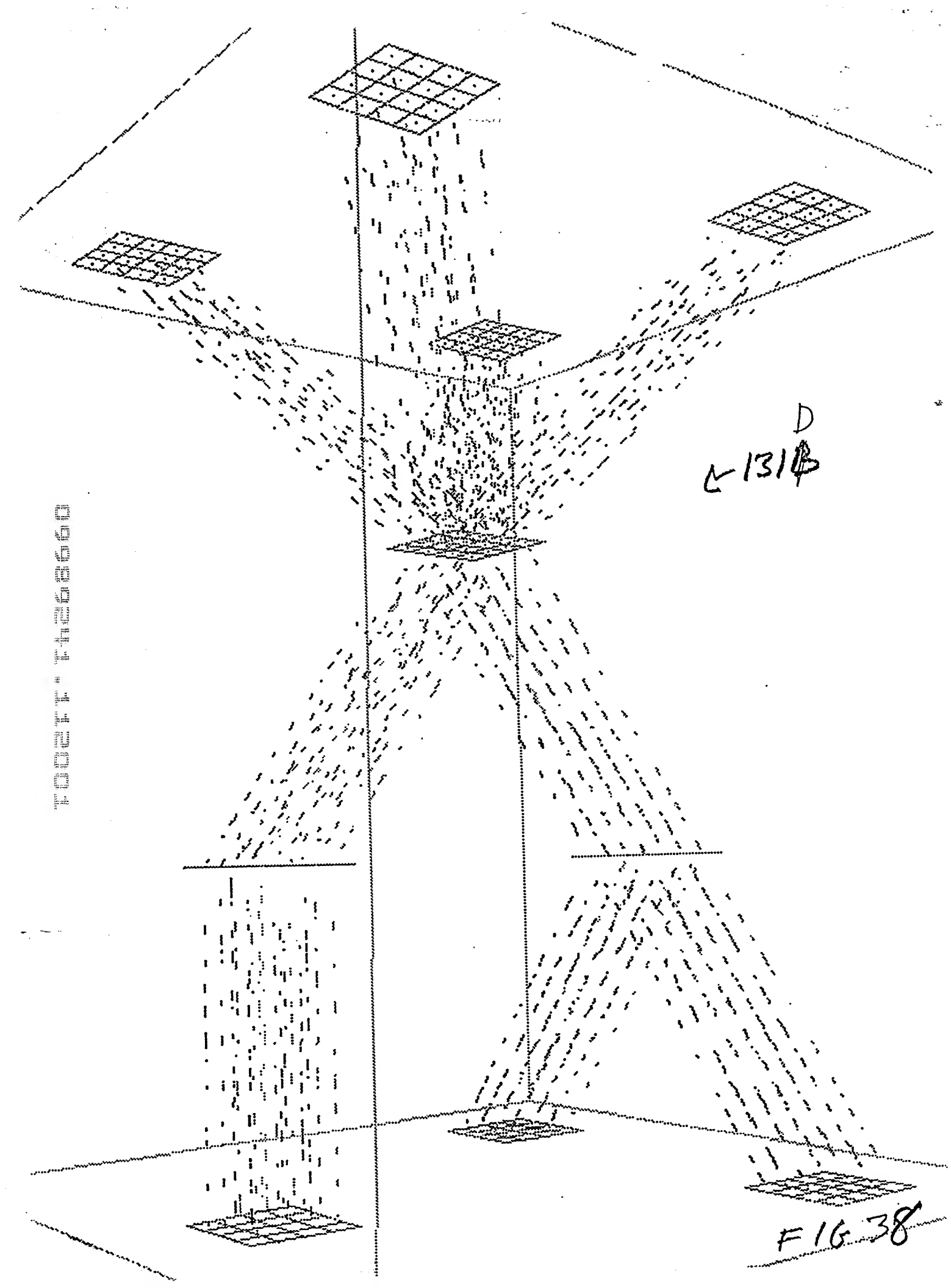


FIG 38

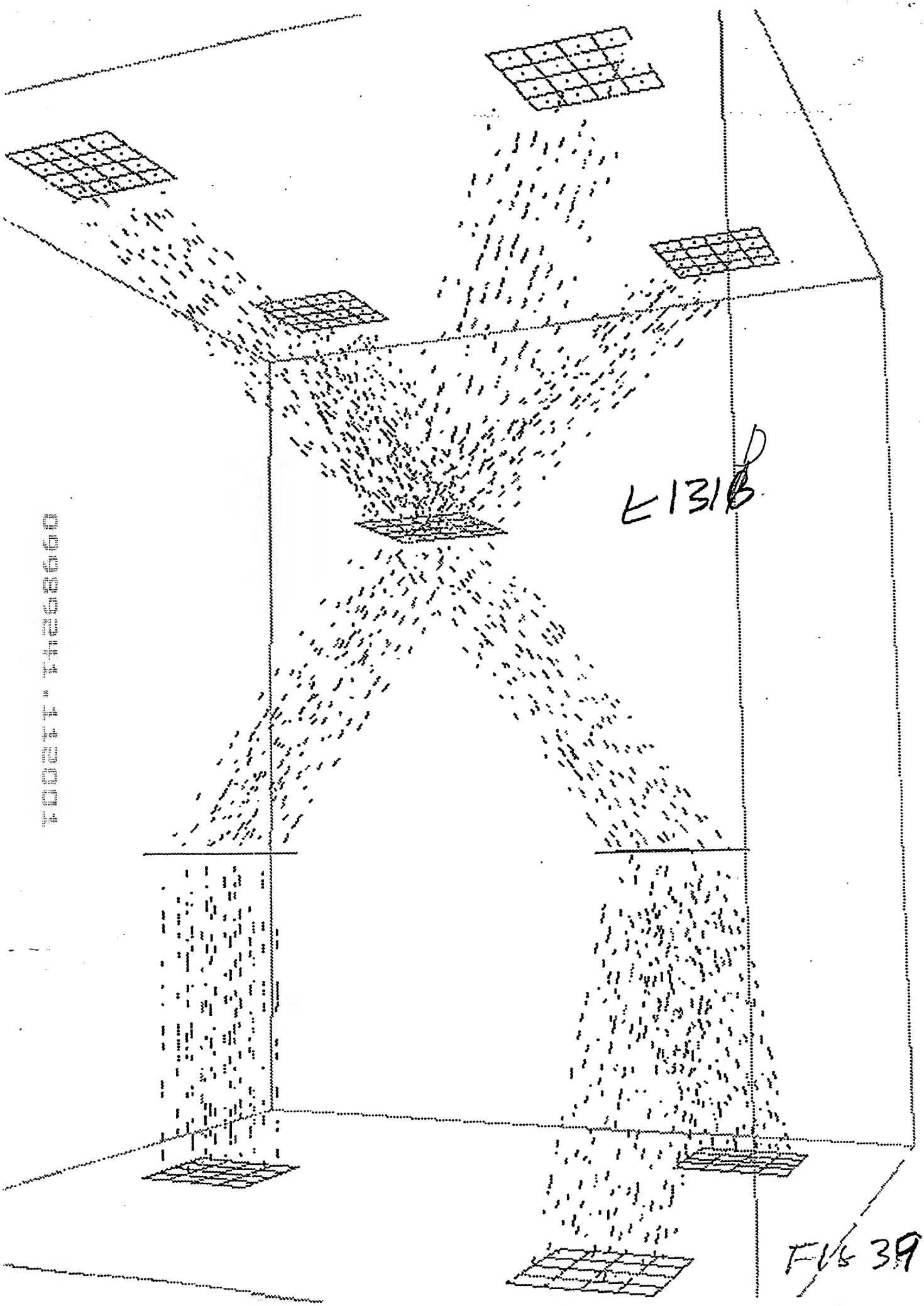


Fig 39

-putRecord~152
-place record in buffer block addressed to one of one or more instances of the output port's consuming input port based the partitioning scheme~420
-if record fills buffer block~422
-if getAndPutMonitoringIsOn, send the performance monitor timed putBlockPending UDP msg, identifying the sourceNode, sourceProcessOnNode, and sourceOutputOnProcess~424
-if output port's datalink is connected to a data set, write block to that data set~425
-else send buffer block to its corresponding consuming input port instance over TCP/IP~426
-call buildAndSendBlockSentMsg~423
-return~462

FIG. 40

-buildAndSendBlockSentMsg~429
-if current block contains EOF or if time since the last blockSent message was sent for current datalink exceeds desired blockSent interval~427
-assemble standard blockSent UDP msg including appropriate values for the messages sourceNode, sourceProcessOnNode, sourceOutputOnProcess, destinationNode, destinationProcessOnNode, destinationInputOnProcess, numberOfRecordsSoFar, numberOfBytesSoFar, timeSent, and isEOFInRecord ~428
-If fieldMonitoringIsOn~430
-for each entry in monitoredFieldTable having matching source and destination~432
-if time since lastTimeRecordSent is greater than desiredSendInterval, place monitorFieldHeader in blockSent, followed by numberOfDesiredValue1, numberOfDesiredValue2, and the extracted field value from last record in current block~434
-If recordMonitoringIsOn~450
-if entry in monitoredRecordTable has matching source and destination~452
-if time since lastTimeRecordSent is greater than desiredSendInterval~454
-place monitorRecordHeader, last record in blockSent~456
-send performance monitor the blockSent UDP message~460
return~461

FIG. 41

-getRecord~148
-if there is no record in input port's input buffer~464
-if getAndPutMonitoringIsOn, send performance monitor timed getBlockPending UDP msg, identifying the node, processOnNode, and inputOnProcess~465
-if input port's datalink is connected to a data set~466
read next block from that data set~467
call buildAndSendBlockSentMsg~468
-else wait until input buffer gets a new block of records~469
-set inputBlockReadPointer to start of new block~470
-set return value to value of inputBlockReadPointer~474
-increment inputBlockReadPointer by length of record~476
-return~478

FIG. 42

-performanceMonitor~128
-initialize~480
-receive score description from process composing score of, and conducting the parallel execution of, the data flow graph~482
-create data structures for all nodes, operators, operator instances and their ports, and datalink instances~484
-determine which operators are in which levels~486
-lay out operators in each level in both 2 and 3-d space~490
-loop until user exits from within~492
-while unprocessed user input, call handleUserMsgs~494
-while msgs in UDP input queue, call handleUDPMsgs~496
-for each graphState portrayed in a replay window, call UpdateReplayGraphState~532
-if time since timeOflastBlockPendingCheck exceeds blockPendingCheckInterval, call blockPendingCheck~550
-for each graph visualization window~554
-if it has been longer than windowUpdateInterval since it was last updated~569
-if window is a 3Dview ~570
-if a flight path is active for window, and if time since last move along flight path exceeds flight path's flightPathFrameInterval, change view parameters according to flight path~572
-if its viewRadiusFromFocus, viewLongitudeFromFocus, viewLatitudeFromFocus, or viewZoom has been changed, call updateWindows3Dto2DProjection~574
-call updateWindowsPixels~576
-if the window is a 2D view update it~629 621
-...

FIG. 43

-handleUDPMsgs~498
-for each message in the queue~500
-if getBlockPending msg, store it in data structure for its associated input port instance~502
-else if putBlockPending msg, store in data structure for its associated output port instance~504
-else if blockSent msg ~506
-if historyRecordingIsOn~508,
-if time since last blockSent was recorded for the msg's data link instance exceeds blockSentRecordInterval, store a copy of blockSent msg in the blockSentHistory file in chronological order by time stamp~510
-if blockSent's isEOFInRecord is true, record blockSent in EOFHistory file~511
-call updateGraphWithBlockSentMsg with the blockSent msg for realTime graphState ~512
-return~530

FIG. 44

-updateGraphStateWithBlockSentMsg~531
-erase any getBlockPending, putBlockPending, hungOnGetRecord, hungOnPutRecord in data structures for all inputs or outputs on same instance having an earlier time stamp than the blockSent msg~513
-if there is a prior blockSent msg recorded for the data link, calculate dataRates for the current blockSent msg's corresponding datalink instance by subtracting numberOfRecordsSoFar and numberOfBytesSoFar from the prior blockSent stored in data structure of the datalink instance having msg's associated source and destination ports from numberOfRecordsSoFar and number of BytesSoFar, respectively, in the current msg and divide difference by the difference in timeSent of the two msgs~514
-store the dataRate in the datalink instances data structure~515
-store the current value of blockSent in the datalink instance's data structure~516
-if blockSent's isEOFInRecord is true, set hasSentEOF in blockSent's corresponding datalink instance~517
-if there is a monitoredFieldHeader in the current blockSent~522
-if there is a window opened to display monitored field information for the datalink instance, feed the monitored field information to that window~524
-if msgFirstOccurrence has been set for either the 1stDesiredValue or 2ndDesiredValue, check if the blockSent msg contains the first occurrence of ~~the~~ either desired value and if so beep and send appropriate window to display~526
-if blockSent contains a monitoredRecordHeader and if there is a window opened to display that record for the datalink instance, feed blockSent's monitored record information to that window's process~528
-return~529

FIG. 45

-updateReplayGraphState~534
-if the time since lastGraphStateUpdateTime exceeds replayUpdateInterval~535
-save the current time as lastRealTimeOfGraphStateUpdate~536
-find next timeBeingReplayed ~537
-scan EOFHistory file and get&PutHangHistory files since the graphState's previous timeBeingReplayed, to update EOF and getRecord and putRecord hang values of port and operator instances~538
-clear the blockSent msgs and dataRate stored for all datalinks in the graphState~539
-for each item in the blockSentHistory file recorded from timeBeingReplayed back to timeBeingReplayed - replayUpdateWindowDuration~540
-if ~~the~~ blockSent msg corresponding datalink for which a dataRate has has not been calculated, in the GraphState call updateGraphStateWithBlockSentMsg~542
-return~543

FIG. 46

-blockPendingCheck~552
-for the data structure of each port instance~556
-if it has a getBlockPending or putBlockPending indication with a time stamp older than normalBlockPendingTime~558
-label the data structure for port as hungOnGetRecord or hungOnPutRecord, respectively~560
-if recording is on, record hungOnGetRecord or hungOnPutRecord, respectively, and its associated time for port instance in get&PutHangHistory file~562
-Return~564

FIG. 47

-updateWindows3DTo2DProjection~578
-set viewDirectionLongitude and viewDirectionLatitude to keep view centered on viewFocus~582
-call calculateGraphs2DProjectionCoordinates~584
-return~586

FIG. 48

-updateWindowsPixels~588
-for all datalink objects in the window which have to be updated and which might contain any transparent segments, erase all pels associated with it~589
-for each object in the visualization window's graphState mapped into the window's 2D projection which has been changed since the last call to this routine~590
-if it is a datalink object~592
-if datalink object's colorSetting is "off", skip rest of loop~594
-else if datalink object's colorSetting is a function of a selected variable~596
-if object is a composite, set its value for the selected variable to the average of the values of that variable from all its corresponding instances~598
-select object's draw color from the position of its value for the selected variable relative to the variable's color map~600
-else if datalink object's colorSetting is a fixed color set its draw color equal to that color~602
-else if datalink object's segmentationSetting is for a color histogram, call colorHistogramSegmentation~604
-if datalink object's segmentationSetting is for dataRate noodles, call noodleSegmentation~606
-if datalink object's segmentationSetting is Solid, set lineSegmentBuffer to one solid segment~608
-call drawLineSegments~610
-if it is not a datalink object, project it into the view's pel map, taking into account what objects block what other objects from perspective of viewpoint~614
-...
-return~616

FIG. 49

-colorHistogramSegmentation~618
-if time or time scale represented by window has changed, update outputPortPointer and inputPortPointer in the lineSegmentBuffer accordingly~620
-if any part of the object's lineSegmentBuffer between its outputPortPointer and inputPortPointer is not segmented, calculate histogram color segmentation for that portion of the buffer from either real time values, or if appropriate, relevant portions of blockSentHistory file~622
-return~624

FIG. 50

-noodleSegmentation~626
-advance outputPortPointer and inputPortPointers in lineSegmentBuffer in proportion to current dataRate~628
-for each part of the object's lineSegmentBuffer between its OutputPortPointer and inputPortPointer which is empty, starting at the outputPortPointer~629
-until such empty portion has been filled~630
-add a new pair of "on" and "off" segments to the buffer, having a density which is a partially random function of link's dataRate for the time frame represented by that segment's location along the line representing the datalink object~631
-if monitoredFieldDisplayIsOn, if the datalink object has a monitored field, and if a blockSent message is detected in the time represented by such pair has a value for that field represented by either a triangle or a ball, replace the pair's "on" segment in the buffer with a triangle or ball~634
-return~635

FIG. 51

-drawLineSegments~636 — Erase all pixels, if any, previously associated with the current data object by step 648 in a previous call to the routine ~637
-for each line segment in the current datalink object's lineSegmentationBuffer which maps into the window~638
-if its color is "off" skip rest of loop~642
-for each successive portion of that line segment which has been projected onto an individual pel of the view~643
-if pel was not formerly colored~644
-if the segment's color is "on", color the pel with the datalink object's draw color~645
-else color the pel with the segment's color~646
-store the ID of the current datalink object in association with the pel~648
-else, if the current datalink object is between the view point and the object previously associated with the pel at the point on each object represented by the pel, store the color of the current datalink object at the pel and associate the current datalink object with the pel~650
-return~652

FIG. 52